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ABSTRACT

The Dynamics of Women's Labour Supply in Developing Countries^{*}

This paper investigates cyclicalities in women's labour supply motivated by the hypothesis that it contributes to smoothing household consumption in environments characterized by income volatility. We use comparable individual data on about 1.1 million women in 63 developing and transition countries merged with country-level panel data on GDP during 1986-2006. The scope of these data is unprecedented in the small but growing literature on labour markets in developing countries. We find that the within-country relationship of women's employment and income is, on average, negative in Asia and Latin America but positive in Africa. We suggest that amongst reasons why African women behave differently are that the conventional family structure with income pooling is less the norm, there are fewer opportunities for paid employment, and aggregate income shocks are more closely tied to rainfall variation. The findings are robust to controls for country-specific trends and potentially correlated shocks. In Asia and Latin America, characteristics that strengthen counter-cyclical responses include low education, being married, being married to men with low education, low wealth, no landownings, rural residence and fertility. These findings suggest that insurance motives underpin the dynamics of women's work participation. Examination of cyclicalities in the distribution of employment across types suggests that recessions in every region are associated with a rise in self-employment amongst women. In Asia and Latin America, there is a parallel rise in paid employment and a sharp drop in non-employment. In Africa, there is a decline in paid employment which overwhelms the rise in self-employment and this is how total employment comes to decline. The results have potentially important implications for understanding labour markets, fertility timing and child outcomes.

JEL Classification: J22, J13

Keywords: insurance, women's labour supply, added worker effect, business cycles, dynamics, Africa, Asia, Latin America

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1 Introduction

Income volatility is endemic in poor countries (Pritchett; 2000; Koren and Tenreyro; 2007). During 1960-99, the median of the standard deviation of annual growth rates was more than three times higher for low-income countries than for OECD member countries (Malik and Temple; 2009). Governments in these countries often face severe fiscal constraints (Fallon and Lucas; 2002) and the tightening of these constraints during economic downturns often leads to cuts in state social spending (Lustig and Walton; 1998; Woo; 2005; Bhalotra; 2009; Loayza et al.; 2007) in contrast to the tendency in richer countries for social spending to rise to smooth over potential dips in household consumption (Lane; 2003). Poor households have limited access to credit (Banerjee et al.; 2007) and formal insurance mechanisms such as unemployment benefits (van Ours and Vodopivec; 2006). As a result, even if income shocks are transitory, they often have severe and irreversible consequences. They may throw families into poverty traps, for example, through the co-dependence of wage income and adult health (e.g. Ray; 1998; Dasgupta; 1997; Eriksson et al.; 2005), raise the death toll amongst newborns (Baird et al.; 2007; Bhalotra; 2009) or leave the survivors amongst exposed children scarred with the prospect of greater later-life morbidity and lower educational attainment (van den Berg et al.; 2006; Ferreira and Schady; 2009).

A vast literature describes how households attempt to cope with idiosyncratic shocks through asset decumulation or reliance upon informal insurance networks (Morduch; 1995; Skoufias; 2003). However many households have no assets to sell and risk pooling arrangements are challenged by aggregate shocks that impose covariant risks on members (e.g. Townsend; 1995). Households may then fall back on the one asset they have, which is their labour. Understanding the dynamics of employment is therefore key to understanding the dynamics of poverty. We focus upon women's labour supply, investigating the extent to which it rises in economic downturns and reverts in upturns. The hypothesis that counter-cyclical employment performs an insurance function is further investigated by allowing interactions between aggregate shocks and indicators of liquidity constraints at the household level. Even if women desire to increase their work participation in downturns, they may be limited by a decline in labour demand. We investigate transitions between unemployment and types of employment, illustrating the role of self-employment. This exercise also illuminates the differences in employment behaviour that we find across the three developing country regions.

The stylized fact for richer countries is that women's labour supply is pro-cyclical, rising in upturns when the offered wage is more likely to exceed the opportunity cost of women's time; for example, see Joshi (1981) for the UK, Killingsworth and Heckman (1987) for the US and Darby et al. (2001) for other OECD countries. There is no stylized fact regarding the cyclicity of women's work in poorer countries. There is some evidence from historical data that women's

employment rose during periods of economic crises and industrial restructuring in 19th century England (Anderson; 1974; Scott and Tilly; 1978, p. 144) and New England (Hareven; 1982, 1990; Lamphere; 1987). Scott and Tilly (1978, p. 144) argue that “the reallocation of women’s labour between productive and reproductive work was part of a widespread economic adaptation of households that emerged to maintain household living standards under restructured economic conditions”. There is some compelling evidence that the economic crisis in 1997/8 in Indonesia threw women into employment, even as male employment rates fell, and that the added women workers were primarily in the informal sector (Thomas et al.; 2003, also see Section 5 below). However, in terms of the proportional decline in average hourly wages, the Indonesian crisis was as severe as the Great Depression of the 1930s in the US or the collapse of Soviet Union in the early 1990s (Fallon and Lucas; 2002) and it is unclear how well these findings would generalise to the case of smaller shocks or alternative institutional settings.

We use a micro-dataset of unprecedented scope in this literature that contains comparable information on 1.1 million ever-married women (and a further 0.1 million never-married women) of age 20-49 interviewed in 129 survey rounds conducted in 43 countries across 21 years, 1986-2006. The micro-data are merged by country and year of interview with cross-country panel data on income (GDP) and other relevant macroeconomic variables. The macro-panel is exploited to create country-year specific indicators of the state of the business cycle. The micro-data are exploited to investigate heterogeneity in the response parameters predicted by theory, for example, with respect to wealth and the stage of the lifecycle (Gruber and Cullen; 1996; Attanasio et al.; 2005). We report a range of specifications designed to balance the trade-off between robustness and efficiency that has been emphasised in the recent literature on growth econometrics (Durlauf et al.; 2005) and explore robustness of the estimates to controls for trended unobservables and country-year varying shocks.

The results show that economic fluctuations are mirrored in significant fluctuations in women’s work. The average tendency is for African women to fall out of employment in recessions, presumably to a very vulnerable position. In contrast, Asian and Latin American women’s employment increases in recessions and heterogeneity in the response parameter by a number of individual characteristics indicates that this is part of a household coping strategy. We suggest that amongst reasons that African women behave differently are that the conventional family structure with income pooling is less the norm (Udry; 1996), opportunities for paid employment are limited and aggregate income variation is more closely tied to rainfall variation with the implication that income shocks strike the sector where women most naturally seek employment (see Section 5.1). Economic fluctuations generate considerable churning across job types, which average employment rates mask. Downturns in Asia and Latin America are associated with women moving from non-employment to both self employment and paid employment. In Africa, the important shifts are out of paid employment and into self-employment

and non-employment.

Previous cross-sectional research shows that women’s labour supply tends to be U-shaped in economic development (Schultz; 1988; Goldin; 1995; Mammen and Paxson; 2000). The upturn at higher levels of development is thought to be driven by gains in women’s education and the emergence, through structural change, of jobs “suitable” to women. The upturn at low levels of development arises because families often need the income from women’s work, and their participation is facilitated by the prevalence of family farms and enterprises. This paper presents a dynamic and more disaggregate picture of life at the low end. On average about 50% of women work in our sample of developing countries. The 50% who do not work include those who are wealthier and/or married to educated men (income effect) and those for whom the opportunity cost of work is high because of high fertility (substitution effect). Our estimates show that transitory participation induced by the business cycle brings in a more diverse set of women, including asset-poor, less educated, younger women with children under the age of five. This invites consideration of the effects that this has upon the timing of fertility and of investments in children.

Studies of poverty dynamics have paid limited attention to the role of macroeconomic fluctuations (Baulch and Hoddinott; 2000; Ravallion; 2001) and studies of the effects of macroeconomic crises on poverty in poorer countries have paid limited attention to the mediating influence of labour market dynamics (Fallon and Lucas; 2002; Skoufias; 2003; Conceição et al.; 2009). This is topical given the ongoing world recession, thought to be the worst since the Great Depression. Growth in developing countries was 1.2 percent in 2009, compared with 5.6 percent in 2008 (World Bank; 2010)¹. In fact, developing countries have been routinely ravaged by crises stimulated by natural disasters, wars, debt, commodity price shocks, financial collapse and the spread of HIV/AIDS. This paper is therefore more broadly relevant to growing interest in the effects of income volatility in poor countries (Koren and Tenreyro; 2007) and especially its effects on human capital investment at critical periods of childhood (Almond; 2006; Cunha and Heckman; 2007; Ferreira and Schady; 2009; van den Berg et al.; 2009), in the transmission of which women’s labour supply is an under-studied mechanism (Basu and Basu; 1991; Rose; 2000; Bhalotra; 2009; Agénor and Agénor; 2009).

2 Background

The motivating hypothesis is rooted in a literature on the added worker effect (AWE) that originated around the Great Depression (see Humphrey; 1940; Woytinsky; 1940). This casts married

¹Uncertainty concerning the likely impact on women’s labour market status is evident in the media, not only for developing countries but also in, for example, the UK and the US (Appendix B includes some relevant quotes from the media)

women as secondary workers who temporarily increase labour supply when their husbands suffer unemployment. The underlying theory is developed in Ashenfelter (1980), Heckman and MaCurdy (1980), Lundberg (1985), Ehrenberg and Smith (2003) and Borjas (2005). In the simple static model, women raise labour supply following a transitory dip in family income if their leisure is a normal good and this effect is enhanced if the increased non-market time of the husband lowers the opportunity cost of market work for the wife through substitution in home production. Given evidence that cross-substitution effects are typically small, the AWE relies upon wealth effects. In a lifecycle setting, as long as the income loss from unemployment is small relative to the husband's lifetime earnings, AWE effects are expected to be small and concentrated amongst families that face liquidity constraints or fixed consumption commitments (Mincer; 1962; Lundberg; 1985). Unemployment insurance in richer countries will tend to crowd out any need for wives to provide insurance (Gruber and Cullen; 1996). Consistent with these predictions, studies set in the US and UK find small if any added worker effects (Stephens; 2002). In aggregate data, the discouraged worker effect tends to dominate and women's work is pro-cyclical (see references in the previous section).

As indicated earlier, there is typically no unemployment insurance in developing countries and a vast fraction of households face subsistence constraints that they are not equipped to borrow to smooth over. In this setting, we may expect to see dominant wealth effects and, in the aggregate, counter-cyclical labour supply, see, for example, Barzel and McDonald (1973) and Stern (1984), who show the importance of asset levels and subsistence constraints in determining the shape of the labour supply curve. The tendency for women in poorer countries to act as secondary workers is likely to be strengthened by traditional family structures and low levels of education and skill amongst women. The informal sector that characterises developing countries facilitates transitory work spells as entry and exit barriers and search costs are low (Basu et al.; 2000). The literature on household insurance mechanisms in developing countries has considered child labour as an insurance mechanism (Jacoby and Skoufias; 1997; Skoufias; 2003) but it contains relatively limited investigation of the role of changes in women's labour supply.

3 Data and Descriptive Statistics

3.1 Data

The micro-data are assimilated from 153 Demographic and Health Surveys (DHS) conducted using a similar questionnaire in 63 developing countries between 1986 and 2006. There are no similar cross-country micro-data on employment and the DHS data have not been used for this purpose before. The potential sample contains 1,777,063 observations on women's work,

education and demographics². Countries and survey years in the sample are in Table 1. For 20 countries, only one survey is available. There are 13 countries with two surveys, 17 with three, 9 with four and 4 with five. We group the countries into five *regions*, sub-Saharan Africa (henceforth Africa), Asia, Latin America, the Middle East and North Africa and the former USSR. About 33.5% of women in the sample are located in sub-Saharan Africa, 33.8% in Asia and 22.8% in Latin America. Another 8% are in the Middle East and North Africa and 2% in the former USSR. Although we present some results for the latter two, the discussion will refer to the 90% of women in the three developing country regions and these are the regions that are pooled for the estimation. We construct nine *sub-regions* within these three regions to capture cultural and institutional heterogeneity (Table 1).

The surveys interview women of reproductive age, typically 15-49 years. We keep women aged 20-49. Of the 153 surveys, 124 interview a representative sample of women. These include all countries in Africa, Latin America and ex-USSR. In the other 29 surveys, which pertain to 15 countries in Asia and the Middle East, the sample was restricted to ever-married women (Table 1). The main analysis is on the sample of ever-married women although we allow heterogeneity as a function of current marital status and fertility. There are no data on hours of work or wages. Wage data for developing countries are not very useful given that unpaid work or self-employment are widespread. The data contain information on the education of the woman and her partner, and education may be thought of as an indicator of the permanent component of individual wages. The business cycle variation that we analyse creates transitory variation in wages and the specifications estimated will allow the impact of this on women's employment to vary with her education and that of her husband. Information on years of education is used to construct dummy variables indicating whether the individual is uneducated (*none*), has some education but less than secondary (*some*), or has completed secondary or higher education (*high*). A household wealth index is constructed using data on ownership of assets and this is used to create indicators for the quartile of the wealth distribution that the household falls into (see the data appendix).

The microdata are merged by country and year of interview with country panel data on GDP per capita in constant prices, inflation, terms of trade, indicators of financial development, rainfall and civil conflict. Definitions and sources of these variables are in the data appendix.

²See www.measuredhs.com where the data, documentation and reports are available by country. We have harmonised the data across countries and survey years. For example, we have adjusted the dates in the Ethiopia and Nepal surveys for the fact that they follow the Julian and the Nepali calendar (Vikram Samwat), respectively. Details are in the data appendix.

3.2 Descriptive Statistics

This section profile's women's employment in developing countries, providing what would appear to be the first broadbrush sketch representative of developing countries. The distribution of women in the sample by country and region is in Table 1 and distributions by sector of employment and individual characteristics are in the data appendix. Summary statistics for all variables analysed are in Table A3.

Averaging across the sample, about 49% of women work compared with about 98% of men, so there is clearly less room for manoeuvre amongst men. The employment rate of men does not vary much across regions, except that it is lower in the ex-USSR (Table A1). Women's employment exhibits considerable variation by region and characteristics (Tables 2 and A1). The employment rate of women aged 20-49 is 64% in Africa, 43% in Asia and 50% in Latin America. Self employment dominates paid employment amongst African women but the reverse is the case in Asia and Latin America (Table A2). The employment rate is U-shaped in women's education but decreases monotonically in their partner's education (Table 2). The between-country variation shows a significantly negative relation between women's work and GDP (Figure 1). Plots of the between-country relationship by continent show that African countries drive the overall negative relationship, the relationship being negative but flatter in Asia and positive in Latin America- and also in the Middle East and ex-USSR (Figure 2)³.

Pooling the within and between country variation (Table A1) we see a negative relation between women's employment and each of GDP and household wealth. A greater percentage of women are employed in recessions as opposed to booms, 54% against 49%, while men's employment is similar in the two regimes (Tables 2 and A1). The relationship with GDP is sharpest at the low end - the bottom 20% of country-year observations in the GDP distribution are associated with sharply higher rates of employment (66%) than the rest of the distribution. The relationship with household wealth is sharpest at the high end- women in the top quartile of the household wealth distribution are much less likely to work (46%) than elsewhere in the distribution. Women's employment rates are 5 points higher in rural than in urban areas. Overall, the correlations are consistent with the hypothesis that women are more likely to work in poorer circumstances (indicated by partner's education, wealth, GDP, rural), and we know that incomes are more volatile in poorer circumstances.

The employment rate of unmarried women is 18 points higher than that of married women, consistent with married women being secondary workers. Amongst married women, employment is 4 points lower if there is at least one child under the age of five in the household, reflecting the widely established tendency for the opportunity cost of work to rise with fertil-

³Following Boserup (1970) seminal work describing how industrialization alters women's traditional social and productive roles, the literature documents a tendency for women's participation to decline relative to men's (Scott; 1986).

ity⁴ Employment rates are increasing in age (cohort), possibly reflecting the fact that younger women are more likely to have young children at home. In Figure 3 we plot employment rates for single mothers, single non-mothers and (currently) married mothers against GDP. Single mothers are the most active group across income levels, consistent with their bearing the primary responsibility for dependents. It is striking that married women with children (in this case not necessarily under the age of five) work more than single women at low but not at higher levels of GDP. This is indicative of their employment being distress-driven. The correlations in these data incorporate unobserved heterogeneity. The more formal analysis to follow uses country and time variation in income to identify the extent to which the dynamics of women's work is driven by distress.

4 Model Specification and Results

We model women's employment as a function of business cycle variation which, it is implicit, creates demand induced declines in the income of primary earners. Studies of the added worker effect have tended to model women's work participation as a function of the labour market status of their husbands (Lundberg; 1985; Stephens; 2002) but this encounters endogeneity and selection problems (Gruber and Cullen; 1996) which the modelling of women's employment as a function of the business cycle avoids.. Our approach has the following further advantages. First, it accommodates changes in earnings across multiple earners, which is pertinent given the extended family structures in poorer countries. A father-in-law or a brother-in-law may well be the main earner and if, say, recessions induce young men to enter the labour market early or elderly men to delay retirement then in the antecedent model their labour supplies would appear as omitted variables. Second, our approach captures the impact on women's work not only of unemployment amongst household members but also of under-employment and wage decline. This is relevant in poorer countries where unemployment is unaffordable and hence ill-defined, and wages tend to carry most of the impact of economic crises (e.g. Thomas et al.; 2003). Also, using US data, Maloney (1987) shows that it is only once employment constraints on the desired labour supply of both husband and wife are allowed that an added worker effect emerges. A third reason to prefer the direct modelling of aggregate income variation is that this is empirically relevant given the considerable variation in developing countries (Section 1). It is important to emphasise that we only seek to answer the question that the reduced form permits

⁴The labour economics literature focuses on substitution effects created by fertility. In developing countries, it is important to recognise that poor health and nutrition have productivity effects (Fogel; 1994; Ray; 1998, chapter 8) which, set against the labour intensity of home production may prohibit work participation. Women may have to spend years in cycles of reproduction especially in areas of high mortality (Dasgupta; 1993, e.g.) or many hours per day collecting firewood and water (Cain; 1986) or walking their children to faraway clinics (Mwabu et al.; 1993).

which is what the direction of cyclicity of women’s employment is. We do not attempt to tie this in directly with the employment status of the husband.

The dependent variable in the analysis is an indicator for whether the woman reports working at the time of the survey⁵. Since employment in developing countries exhibits considerable seasonal variability the pattern of which may differ across space and time, we control in all specifications for the quarter of interview of the individual woman. We also adjust annual GDP data by the month of interview of the woman so that, for every woman, GDP refers to GDP in the 12 months preceding her month of interview.

The data are microdata nested within a short and unbalanced country panel. The baseline model incorporates country fixed effects and trends and consistently allows heterogeneity in the income effect by education and region (Section 4.1). To test the hypothesis that women who have relatively limited alternative sources of insurance are more likely to exhibit counter-cyclical employment, we exploit availability of individual data to model interactions of aggregate income with proxies for the wealth and the consumption commitments of women, (Section 4.2). We then investigate cyclical employment transitions across sectors (Section 4.3). The results are subject to a range of robustness checks (Section 4.4), including adding controls for country-specific shocks, varying functional form and allowing lagged effects. We also estimate alternative specifications that trade off controlling for cross-sectional unobserved heterogeneity against reducing measurement error bias. The findings are woven into the discussion of methods that follows. The results are set in relation to the available literature in Section 5.

4.1 Country Fixed Effects

Individual employment is regressed upon country-specific log income (Y_{cgt}), controlling for individual characteristics, country fixed effects and country-specific trends:

$$L_{icgt} = \alpha + \beta Y_{cgt} + X_{icgt} \gamma + Z_{cgt} \theta + \eta_c + \delta_{1c} t + \varepsilon_{icgt}, \quad (1)$$

L_{icgt} is an indicator for whether woman i of country c in region g reports employment when interviewed in year t . Country dummies comprehensively capture persistent institutional and cultural determinants of women’s work, so that time-invariant omitted variables will not bias the estimates even if they are correlated with the explanatory variables. Recall that the country panel is unbalanced and contains irregular time intervals between observations once it is matched into the microdata because the number of surveys and the spacing between surveys varies across countries. The within-groups estimator is (unlike the first difference estimator)

⁵Current employment is likely to be reported by women with little error. In contrast, labour force participation and unemployment are notoriously difficult concepts in developing countries. Since unemployment insurance is scarce and job search is largely informal, it is uncommon to register participation or unemployment.

robust to this; it simply translates each observation into deviations from the country mean. The distance between observations (typically quinquennial) diminishes serial correlation in the errors. Country trends control for trended unobservables. Controls, X , for individual heterogeneity include dummy variables for the woman’s age cohort (20-24, 25-35, 36+), her education (*none, some, high*), her current marital status, her partner’s education if she is currently married, whether she is household head, the season of her interview, her rural/urban location, the wealth quartile of her household and the number of children she has under the age of five. Z includes the share of women of working age in the population and the inverse of the urbanisation rate. These are not displayed in equation (1) but we also include interactions of income with the index woman’s education and we estimate the equation not only for the entire sample but also for each region. We estimate linear probability models and adjust the standard errors for heteroskedasticity. The LPM is expected to behave well as the mean of the dependent variable is close to 0.5. We nevertheless checked that there were few (1%) predictions outside the 0-1 range, and that the marginal effect from a probit (-0.07) is almost identical to the LPM coefficient. A number of alternative specifications are investigated below. The estimation sample pools data from the 43 countries with at least two survey rounds. It contains one million women (n), 43 countries (N) and between 2 and 5 survey rounds (T).

Results are in Table 3. The average coefficient for the sample of developing countries is -0.074, which is significant at the 1% level. So a recession involving a 10% drop in GDP is associated with a 0.74% point increase in women’s employment. A one standard deviation change in GDP in this sample is 6.3%, and our estimates predict that this would result in a 0.47% point change in women’s employment. The average effect is driven by the 87% of women with less than secondary education, the employment of women with secondary or higher education being acyclical on average. Disaggregating by region, we find that women’s employment is countercyclical in Asia (-0.13) and Latin America (-0.16) but that it is significantly *procyclical* in Africa (0.07), in each case for women at every educational level. The education gradient in the coefficient in each region indicates that cyclicality is weakest amongst women with at least secondary education, consistent with their greater labour market attachment. Estimates for Middle East-North Africa and for ex-USSR, in line with those for Asia and Latin America, are negative. We suggest why Africa stands out in Section 5.1 below. Coefficients on covariates other than income are in Table A4

4.1.1 Country specific equations

Although we are able to control for individual heterogeneity and we have modelled heterogeneity by region and by women’s education (and will extend this in Section 4.2), it is plausible that there remains heterogeneity at the country level. If so, as the model is linear, the pooled

coefficient in equation (1) provides the average treatment effect. In this section we show the results of investigating heterogeneity across countries. For the thirteen countries for which $T \geq 4$, we estimated country-specific equations as follows-

$$L_{it} = \check{\alpha} + \check{\beta}Y_t + X_{it}\check{\gamma} + Z_t\check{\theta} + \check{\delta}_1 t + \check{\varepsilon}_{it}, \quad (2)$$

These include country-specific fixed effects (α) and country-specific trends as did equation 1 but are more general as they allow every parameter to be country-specific. To benchmark the country-specific results, we first present panel estimates of equation (1) using the (smaller) sample of countries for which $T \geq 4$ ($n=0.37m$, $N=13$), see panel B, Table 3. The income coefficients are more negative in this sub-sample, the average coefficient being -0.17. The pattern of results is as in panel A with the exception that African women now, on average, exhibit countercyclical behaviour.

The country-specific results are in Table 4. The income coefficient is significantly negative in eight of the thirteen countries, insignificant in three and significantly positive in two. It is negative in every Asian and Latin American country in the sample. The two countries that exhibit pro-cyclical employment (Ghana and Zimbabwe) and two of the three with insignificant coefficients (Mali and Uganda) are in Africa. The remaining two African countries in this sample, Kenya and Senegal, show a significantly negative coefficient. The greater heterogeneity within Africa implies that the sign of the pooled coefficient for Africa will be sensitive to the country composition of the sample (as we have seen) and to the strength of controls for regional heterogeneity (as we shall see in Section 4.4.2).

4.2 Gradients of the Relationship

This section investigates whether evidence of counter-cyclical employment is stronger amongst women who have relatively limited alternative sources of insurance against income shocks. The baseline equation is augmented to include interactions of income with indicators of this (W), namely, marital status, partner's education, household wealth, land ownership, rural location, and the presence of at least one child under the age of five. We also allow the income effect to vary by cohort, disaggregating cohorts by education and fertility.

$$L_{icgt} = \hat{\alpha} + \hat{\beta}Y_{cgt} + \phi(Y_{cgt} * W_{icgt}) + \omega W_{icgt} + X_{icgt}\hat{\gamma} + Z_{cgt}\hat{\theta} + \hat{\eta}_c + \hat{\delta}_{1c} t + \hat{\varepsilon}_{icgt}, \quad (3)$$

We present average coefficients for the entire developing country sample and estimate the equation for each of the three regions. The average coefficient can be misleading because it often averages over negative coefficients in Asia and Latin America and a positive coefficient

in Africa. Dividing the sample of ever-married women into those who are married at the time that the employment information is recorded (90%) and those who are not, we find that married women’s employment is more sensitive to the cycle, which is consistent with their being secondary workers in the household⁶ Amongst married women, those whose husbands have secondary or higher education (21%) exhibit the weakest counter-cyclical, consistent with husband’s education being a proxy for his permanent earnings (Table 5). The strength of the counter-cyclical response is decreasing in household wealth and is weaker in households that own agricultural land (30%) (Table 6). All of these patterns hold on average and in each of Asia and Latin America. We find that pro-cyclical behaviour in Africa is stronger amongst women who are currently married, have well educated husbands and wealth in the upper quartiles of the distribution. This is consistent with the more constrained women being more likely to be permanent or primary workers. The one exception to this pattern is that African women who do not own land and, by that criterion, are more likely to be constrained, exhibit greater pro-cyclical. Rural women in Asia exhibit greater sensitivity to cyclical variation than urban women, possibly because their incomes are relatively volatile and credit and insurance are harder to access. As with the other interactions for Africa, the more constrained (rural) women exhibit weaker pro-cyclical (Table 7). The rural and urban coefficients are similar in Latin America.

In Asia and Latin America, ever-married women with at least one child under the age of 5 (64%) at the time of the survey are more responsive to cyclical variation than women without (Table 7). This interaction effect is as we may expect if dependent children raise the subsistence requirements of the household and women with young children are secondary workers. The latter is suggested by the direct effect of this indicator of fertility being negative, that is, income-constant, women with a young child are less likely to work, just like women the world over (e.g. Angrist and Evans; 1998). In Africa, women with young children show weaker pro-cyclical⁷. The results so far can be summarised as showing that in the regions where counter-cyclical is evident, it is stronger amongst women who have higher consumption and time commitments (young children), lower non-labour income (marital status, marital status*partner’s education, wealth, land) and, possibly, more volatile incomes (rural) (Tables 5 to 7).

We also investigated heterogeneity of the employment-income relationship with respect to the index woman’s education and cohort. Her education and cohort are natural predictors

⁶Women who were married but are currently without a partner are more likely to be primary workers who are employed even in good times.

⁷We also estimated the model for never-married women with no children for Africa and Latin America; there was too small and unrepresentative a sample of never-married women for Asia. Never-married women in Latin America exhibit counter-cyclical employment but to a lesser degree than their married counterparts, consistent with our results on current marital status and fertility. Never-married women in Africa exhibit counter-cyclical employment in contrast to their married counterparts

of her employment *level*. Her education is likely to influence her *response* to income shocks because less educated women tend to suffer smaller losses from labour market absence or to engage more readily in transient work (e.g. Attanasio et al.; 2005). Her cohort is likely to modify the income gradient if cohort is correlated with fertility or attitudes towards labour market attachment. The education gradient was presented in Table 3 where we observed that counter-cyclical behaviour is stronger amongst less educated women. We now show that this pattern holds within age-cohort, using the age groups 20-24 (sample mean of .22), 25-35 (.43) and 36-49 (.35) (Table 8)⁸. Responsiveness to income shocks is increasing in age-cohort. This appears to contradict results of fertility interactions since the probability of living with a child under 5 is decreasing in age (81.4% of 20-24 year olds, 73.7% of 25-35 year olds and 43.8% of older women have at least one child under the age of 5). However income effects specific to cohort and fertility reconcile this- women with young children show stronger countercyclical responses in every age group and the strength of the response is increasing in age (Table 8).

Overall, the results in this section lend considerable support to the hypothesis that women's transient employment is motivated by insurance needs. They show that women who enter the labour market in downturns are a more diverse group including poorer women, women with young children, older women and married women who, in better times, are less likely to work. As discussed in Section 1, this motivates concern about the implications of this sort of transitory labour supply.

4.3 Employment Transitions

It has been argued that the discouraged worker effect overwhelms the added worker effect in aggregate data (Cain; 1966). If the unemployment of men is rising or their wages are falling on account of a general downturn then the shadow wage of their wives will be falling as well, making it less likely that women seek and are able to find employment. We expect that this argument is less relevant in developing countries to the extent that binding subsistence constraints override marginal substitution effects and there is an expansive informal sector to which entry and exit barriers are low. To illuminate this, we estimate a multinomial logit model in which the dependent variable is $\ln P_i / (1 - P_i)$ where P_i is the probability of being self employed (.25) or not employed (.56) relative to being in paid employment (sample mean of 0.19). Definitions of these categories of work are discussed in the data appendix. The sample and the specification of the independent variables is as for the baseline equation (1). See Table 9. On average across the entire set of developing countries, recessions are associated with an increase in self-employment

⁸A similar finding emerges in scattered case studies, for example, analysing the stabilization period in Costa Rica when aggregate income fell, Gindling (1993) finds that additional work participation was largely of less educated women.

and a decline in non-employment relative to paid employment⁹ This suggests that the overall increase in employment in recessions comes from women who were previously not participating taking employment and that this is predominantly self employment. The move towards self-employment is of similar magnitude for women of different educational levels and apparent in every developing country region. The relative increase in non-employment is bell-shaped in women’s education. It is plausible that, amongst uneducated women this reflects unemployment while, amongst women with higher education, it reflects non-participation. The individual LPM estimates suggest that recessions produce a rise in self-employment amongst women in each of the regions but these additional workers come exclusively from non-employment in Asia and Latin America whereas, in Africa, the increase in self-employment is entirely fed by a decline in paid employment. The responses flowing from a 10% decline in GDP are, in probability units, as follows. In Asia, non-employment declines by 0.17 and this is distributed as 0.10 in paid and 0.07 in self-employment. In Latin-America, non-employment declines by 1.22, which is distributed as 0.385 in paid and 0.835 in self-employment. In Africa, paid employment declines by 0.39 and this is distributed as 0.24 in self-employment and 0.15 in non-employment

4.4 Specification Checks

4.4.1 Correlated Shocks

It is unlikely that there is any substantial feedback from changes in women’s labour force participation to changes in income and, if there were, this would be positive and we would underestimate counter-cyclicality. However shocks at the country-year level that influence both Y and L may bias β and they may not be adequately captured by the combination of country dummies and trends in the model¹⁰. To investigate this, we instrumented Y (GDP) with rainfall shocks (as in Miguel et al. (2004); Ciccone and Fargas (2008) who use data for Africa) and terms of trade (as in Pritchett and Summers (1996) who use data from across developing countries). The instruments are powerful but the test of over-identifying restrictions fails ($p=0.0$)¹¹ Pritchett and Summers (1996) and Miguel et al. (2004) use these instruments one at a time and so are unable to directly test for their validity. The findings direct attention to the importance of distinguishing external from exogenous variables in the selection of instruments (Heckman;

⁹We also obtained linear probability estimates for the specification of the baseline model with the dependent variable now defined for a specific employment category rather than for any employment. This gives absolute rather than relative effects. A 10% drop in GDP is associated with increase in the probability of self-employment of 0.032 and a decline in the probability of non-employment of 0.04, with the probability of paid employment actually increasing by 0.008. Each of these changes is statistically significant.

¹⁰For example civil conflict is associated with lower income (Miguel et al.; 2004) and, as was the case after World War II (Acemoglu et al.; 2004), may have influenced women’s participation.

¹¹Our finding that both rain and terms of trade shocks influence women’s employment conditional upon income shocks is unsurprising given that these shocks are likely to alter the structure of production (income constant) and women’s work is often sector-specific.

2000; Deaton; 2008). Rainfall shocks are popular as instruments because they are clearly external to women’s employment, being generated by nature and, similarly, terms of trade are determined outside the country, but this does not guarantee that the influence of these variables on women’s work operates exclusively through income. Other studies have instrumented GDP with settler mortality (Acemoglu et al.; 2001), ethno-linguistic fractionalisation (Easterly and Levine; 1997) and identity of coloniser (Shleifer and Vishny; 1998). Their exogeneity is an article of faith but, in any case, as these instruments are time-invariant, they are not useful here where the identifying variation is over time. We abjure the use of IV and, instead, explore sensitivity of our estimates to including as regressors a set of observable country-year variables, including rainfall shocks, terms of trade, civil conflict, inflation and financial development (column 6, Table 10). The income coefficient is smaller (-0.028) and significant at the 10% level (t-statistic of 1.9). The drop in the coefficient is consistent with GDP being correlated, as we know it is, with the added macro-variables. It can be argued that the baseline model which suppresses these additional macro-variables denotes the “full” effect of GDP shocks.

4.4.2 Sub-Region and Region Fixed Effects

A recognised problem in the growth literature is that any reduction in bias gained by discarding between-country variation tends to exacerbate measurement error and typically comes at the expense of lower efficiency. For these reasons, Barro (1997), Temple (1999), Pritchett (2000) and Wacziarg (2002) all argue that country fixed effects in cross-country models need to be used with caution; see Durlauf et al. (2005, section 6.2). These concerns are pertinent in the current context and they suggest that we may be under-estimating the GDP coefficient. An increase in the noise to signal ratio generated by taking differences or deviations from means is greater the more persistent the variable and income (GDP) is a highly persistent variable (Griliches and Hausman; 1986). Moreover, GDP in developing countries is often measured with error. For example, the Penn World Tables (PWT), from which GDP data are routinely drawn for research, reckons that data for all 43 sub-Saharan African countries have margins of error of 30-40%. Johnson et al. (2009) show that successive versions of the PWT produce radically different rankings of African countries by rates of growth between the same years¹²

As a robustness check we estimate a model that includes not only within-country variation as before but also the between-country variation within *sub-regions*. We created nine sub-regions within the three developing country regions (the Middle East and ex-USSR groups are small and left as they are)¹³. Amongst developing countries, weighting by the number of countries per sub-region, the average sub-region includes 21 survey years; precise years per sub-region

¹²If the measurement error is fixed at the country level then the country fixed effects model is at an advantage. However this may be too restrictive a characterisation of measurement error.

¹³For this we used on-line maps and common knowledge.

are in Table 1. We re-estimated equation (1) replacing country (c) fixed effects with sub-region (r) fixed effects and obtained estimates of equation 4 for the full sample and each region. As the time series within country is now much longer, these equations include a quadratic in the sub-region or region-specific trends and year fixed effects¹⁴.

$$L_{icrt} = \ddot{\alpha} + \ddot{\beta}Y_{crt} + X_{icrt} \ddot{\gamma} + Z_{cgt} \ddot{\theta} + \ddot{\eta}_r + \ddot{\lambda}_t + \ddot{\delta}_{1r} t + \ddot{\delta}_{2r} t^2 + \ddot{\epsilon}_{icrt}, \quad (4)$$

This sort of strategy is not uncommon¹⁵ Omitted variables that stand to bias the estimated relationship between women’s employment and income include labour market or family institutions, for example, the extent of state-provided unemployment insurance or conventions regarding income pooling. There is no reason to believe that the country is the natural level at which these institutions vary, for example, family norms may vary across ethnic groups that cut across countries. Regions represent a stable division of people with a fairly distinct history and culture. In contrast, the borders of countries within these regions are, in many cases, arbitrary, with ethnicity, language and culture crossing country borders. A vast literature questions the construction of nation states under colonial rulers¹⁶.

Results are in Table 11. Using the sample on which equation (1) was estimated ($n=1m$, $N=43$, $T \geq 2$) but replacing country with sub-region fixed effects, we find a similar pattern of results by region, indicating pro-cyclicality in Africa and counter-cyclicality in Asia and Latin America¹⁷. The results are qualitative similar when we use the larger sample that incorporates the 20 countries for which only one survey round is available (7.4% of the potential sample of

¹⁴The income coefficient is stronger if instead we use region-year fixed effects.

¹⁵For example, Besley and Kudamatsu (2006) use region (\sim continent) rather than country fixed effects in their baseline model and Acemoglu et al. (2001), amongst others, include no controls for unobserved heterogeneity in their baseline specification, exploring region fixed effects in a variant. In the micro-panel literature, there are thousands of individual firms or households that, unlike countries, have no particular identity of interest and the accepted strategy is to purge firm effects. In the growth literature, on the other hand, including country fixed effects often absorbs a lot of the variation of interest, especially when the variation is limited whether because the variable is naturally sluggish or because T is small. The latter is the case in our baseline model.

¹⁶This literature cuts across history, political science and anthropology. Amongst them the following studies more than make the point. All of the chapters in Cohen (1995) are relevant but see, for example, Aderanti Adepoju’s contribution to Section 6. Baud and van Schendel (1997) and Parker (2006) provides an accessible overview. The Centre for International Borders Research at <http://www.qub.ac.uk/cibr/> provides links to a wealth of material for each sub-region, for example, <http://www.qub.ac.uk/cibr/BordersBiblioAfrica.htm>. Howard French (undated) provides useful detail for Africa and Kaufman (1976) for Latin America and East Europe, although relevant reference to boundary setting in Africa and Asia is also made. Multiple authors document sub-region specific cases in a book series, *Arbitrary Borders: Political Boundaries In World History Set, 17-Volumes* referenced as published by Chelsea House.

¹⁷The only notable qualitative difference in the results is that employment amongst women with secondary or higher education in Latin America is no longer countercyclical. Note that the total effect, obtained on the sample that pools the three developing country regions is misleading because it is an average over a larger positive coefficient for Africa, a weaker negative coefficient for Latin America and a larger negative coefficient for Asia. These changes in coefficients indicate the sign of the between-country within-sub-region relationship between L and Y

women); $n=1.07m$, $N=63$, $T \geq 1$ (panel B of the table).

We took this a step further, estimating an equation with fixed effects for the three *regions* rather than the nine sub-regions. Within sub-Saharan Africa, we have 75 survey years (observations) for 30 countries, within Asia, 23 years for 10 countries and within Latin America, 32 years for 12 countries (see Table 1).

$$L_{icgt} = \tilde{\alpha} + \tilde{\beta}Y_{cgt} + X_{icgt} \tilde{\gamma} + Z_{cgt} \tilde{\theta} + \tilde{\eta}_g + \tilde{\lambda}_t + \tilde{\delta}_{1g} t + \tilde{\delta}_{2g} t^2 + \tilde{\varepsilon}_{icgt}, \quad (5)$$

Results are in Table A5. The estimates are close in magnitude and sign to the estimates from the model with country fixed effects, with the difference that Africa now appears to have counter-cyclical female employment just like the other two regions. This suggests that while the within-country and within-sub-region variation in L and Y produce a positive relationship in Africa, their between-country (and between-sub-region) variation is negatively related- this is clear in Figure 2. This of course does not challenge the baseline within-country estimates, it merely shows that using the between-variation preserves the baseline results if it remains within sub-region but that the between-country variation across sub-regions is of the opposite sign in the case of Africa. To the extent that the between-country findings indicate a long run relationship, this is of independent interest.

4.4.3 Other Specification Checks

This section investigates extensions that include adjustment of GDP for month of interview, allowance of dynamics, generalisation of functional form, the use of country-averaged panel data and asymmetry in the income effect. The baseline model for these checks is that in equation (1). Results are in Table 10. Columns 1-2 show that the pooled conditional correlation is -0.18, falling to -0.067 when country fixed effects and trends are included. This suggests that, in the developing country sample as a whole, the between-country relationship is negative (as in Figure 1). As explained earlier, we use GDP adjusted for the month of interview of the index woman. Since this is of potential relevance to other studies that use information gathered at a point in time on a variable that exhibits seasonal variation, we investigate how much difference this makes. On this sample, we find it makes no difference (column 3). If families do not anticipate aggregate income variation or there are job search lags, women's employment may respond with a lag. Including lagged GDP in the model together with its current value, we find that the action is in the first lag and that the long run effect (the sum of the coefficients on current and lagged income) is the same as in the baseline model (column 4). If we retain only lagged income in the model (not shown), its coefficient and standard error are almost

identical to those on current income. We therefore proceed with the baseline model¹⁸. We next included a quadratic in Y , so as to allow for example that larger income shocks are more likely to stimulate distress work. The quadratic is significant but the turning point is at the 4th centile of the income distribution, so the relationship is predominantly negative (column 8) and the baseline specification therefore seems reasonable.

The standard errors reported so far are robust but they are not fully adjusted for non-independence within countries. Our reasoning was that country fixed effects absorb relevant unobservables that are common across women and that autocorrelation in the errors is made less likely by the fact that the time intervals are wide. Recall that the number of observations within a cluster ($n \sim 1$ million) is very large, the number of clusters is fixed (N - typically 43, goes up to 63) and T is small. So, rather than adjust the standard errors for clustering at the country level, we estimated the baseline model on a country panel obtained by averaging across women in a country for each year to get an employment rate. The standard errors are now much larger and the income coefficient is insignificant but the point estimate is twice as large as in the baseline case (it is -0.152 with a s.e. of 0.22). One interpretation of this is that we do not have sufficient independent variation to identify the income coefficient precisely. Another is that the model estimated on country-averaged data is not correctly specified (e.g. Gelman and Hill; 2007), in particular, the insurance hypothesis naturally involves heterogeneous behaviour within country which we have modelled by allowing the income coefficient to vary with the index woman's education and indicators of her risk of being liquidity constrained.

The hypothesis is that women enter the labour market in recessions and exit in booms. It seems plausible that they may enter because consumption constraints compel income-generating activities but then persist in the activity when conditions improve (Spletzer; 1997). We therefore investigate asymmetry in the main effect as follows. We create an indicator for recessions which is defined as unity for years in which GDP has grown relative to the preceding year and include an interaction term between the recession indicator and income in the baseline model¹⁹. This is negative and significant although small, indicating that recessions stimulate more entry than booms stimulate exit (Table 12). Note that these results rest on 12% of annual changes in GDP in the data being negative, the other 88% were positive. Note also that these estimates, which involve annual income changes, do not directly correspond to the baseline estimates where recessions are indicated by deviations of income (often spaced four or five years apart) from trend.

¹⁸Recall that the DHS sample contains irregular intervals between years. However we have annual GDP data and so we use the genuine first lag. A simple regression of income (GDP) on its first lag yields a coefficient of 1 and has an R2 of 0.996.

¹⁹Although we have employment data only for the irregular DHS years, we use the publicly available annual time series of GDP to construct the first lag. The dummy $recession = 1$ ($dlogGDP < 0$).

5 Discussion

5.1 Africa

The benchmark model for analysis of married women's labour supply assumes income pooling (e.g. Lundberg; 1985). Empirical evidence has called this into question and a number of the violations documented are in Africa (Schultz; 1999; Udry; 1996; Jones; 1986). To the extent that African women do not rely financially upon men, they will tend to behave as primary workers. As we have shown, pro-cyclical employment signifies the loss of paid jobs in recessions, only some of which is compensated by a rise in self-employment. Aggregate income shocks in Africa, more than in Asia and Latin America, are often driven by unexpectedly adverse rain conditions and the main sector in which women work is agriculture. So a possible explanation of our findings is that African women are disadvantaged by the fact that the sector that experiences the negative shock is the sector in which they naturally seek employment. The alternative of informal paid employment appears to be more restricted in Africa than in the other two regions. For each region, we ran a regression of log GDP on rainfall shocks, country and year dummies, country-specific trends and demographic controls. The coefficient on rain shocks was 0.20 in Africa, 0.013 in Asia and -0.023 in Latin America, significant at the 1% level in each case.

5.2 Relation to Previous Findings

The sensitivity of women's work to recessions has been highlighted in a historical literature; see the collection of papers in Rubery (1988). This literature invokes competing hypotheses concerning the dynamics of women's work. The buffer hypothesis predicts that women are disproportionately laid off in recessions and recruited in booms, while the substitution hypothesis predicts that women are substituted for men in recessions as employers pursue cost-saving and households seek to maintain living standards (Humphries; 1988). Recessions were associated with direct substitution of women for men in the US (Humphries; 1988) and indirect substitution of unstable jobs (for women) for stable jobs (for men) in Britain (Rubery and Tarling; 1988). Some evidence, of employers encouraging married women with children to leave formal sector employment during the Korean economic crisis, and of a corresponding rise in informal employment in this group is cited in Kim and Voos (2007).

The few available cross-sectional estimates for developing countries conform with the hypothesis that labour supply curves may be forward falling (negative at low wages) rather than positively sloped or backward bending (negative at high wages) when liquidity constraints are important. For example, Hernández-Licona (1996) and Bhalotra (2007) find negative own-wage elasticities amongst women in urban Mexico and rural India respectively. Analysing an alternative dataset from rural India, Rosenzweig (1980) finds that less market work is supplied

by women in wealthier households located in agricultural development districts and in areas experiencing good weather. There is little systematic evidence on the cyclicity of women's labour supply in poorer countries. Recent exceptions include Hernández and Romano (2009) and Bhalotra (2009) who show that women's labour supply is counter-cyclical in urban Mexico and rural India respectively and that, in both cases, this is most evident in informal sector work. Further country-specific evidence consistent with our hypotheses emerges from analyses of crisis episodes. The Introduction referred to Thomas et al. (2003) who present a particularly insightful analysis showing that, during the Indonesian economic crisis of 1997/8, wages fell by 40%, employment amongst men declined by 1.5% and employment amongst women increased by 0.8% (in a year). Contrary to expectation (e.g. World Bank; 1998), aggregate employment was remarkably stable but this masked considerable turnover, especially amongst women. Large numbers of women entered and left the labour market but entry was about twice the exit rate. The added workers were mostly self-employed and are estimated to have made a substantial contribution to maintaining income. Tanzania's recession in the mid-1980s was similarly associated with an expansion of informal sector work amongst women (Tripp; 1992). However, evidence for the peso crisis in (urban) Mexico is mixed. McKenzie (2003) argues that it had no impact on the labour force participation of men or women, but Parker and Skoufias (2004) demonstrate significant increases in women's participation. This study has contributed by studying the dynamics of employment with microdata that permit analysis of heterogeneous responses by individual characteristics, while also allowing cross-country and cross-region comparisons.

Simulations of a multi-sector model calibrated for Mexico suggest that the size of the informal sector moves inversely to productivity (in either sector); see Satchi and Temple (2009). Consistent with this, analyses of survey data from (urban) Mexico show that informal sector employment is counter-cyclical (Bosch and Maloney; 2007) and that it is decreasing in family income (Gong et al.; 2004). This paper differs from these studies in focusing upon women. Previous work has highlighted the paucity of rigorous analysis of the role of women's work in structural adjustment processes in developing countries (Horton et al.; 1994) and the more general tendency to neglect labour market structure and behaviour in studies of aggregate development (Agénor; 1996, 2004, 2005; Fields; 1984; Freeman; 1992). There is a somewhat related US literature concerned with the role of job reallocation in adjustment to aggregate shocks and the dynamics of big vs. small firm employment (Davis and Haltiwanger; 1992).

6 Conclusions

The between-country relationship between women's employment and aggregate income is negative in Africa, flatter but still negative in Asia and positive in the other regions. The within-

subregion and the within-country relationships are, on average, negative in Asia and Latin America but positive in Africa. These conditional correlations are robust to controls for country-specific trends and potentially correlated shocks including, for instance, rainfall, inflation and war. We find evidence of asymmetry with employment responses to declining income being stronger than to rising income, although the difference is not large. We suggest that amongst reasons why African women behave differently are that the conventional family structure with income pooling is less the norm, they show a greater baseline participation in agriculture, and aggregate income shocks are more strongly correlated with rainfall shocks. Country-specific estimates for selected countries indicate greater heterogeneity in income responses within Africa than within the other regions. The counter-cyclical tendency in women's employment behaviour is stronger in households that face a greater risk of consumption inadequacy in the wake of income shocks. This is indicated by the woman's marital status, the education of her husband (if married), household wealth, land ownership, rural location and the presence of young children. These findings buttress the hypothesis that insurance motives underpin the dynamics of women's work participation. We also allow heterogeneity in the income coefficient by education and cohort of the woman. Less educated (and older) women are most likely to exhibit transient employment in downturns, consistent with their incurring lower skill depreciation during absences. Examination of cyclicity in the distribution of employment across types suggests that recessions are associated with women in Asia and Latin America shifting from non-employment to both paid and self-employment while, in Africa, paid employment falls and women are thrown into both self-employment and non-employment. The rise in non-employment amongst women in Africa indicates that they are constrained in their ability to insure their households.

Although we extensively model heterogeneity, our main contribution is probably to offer stylized facts based upon a broad brushed picture for a large sample of developing countries. Future work might conduct more experimental studies of specific cases and analyse more carefully the role of institutions. A fine extension of the analysis would be to model fertility timing jointly with the timing of women's employment. Further research is also needed on the impact of exogenous changes in the employment of mothers on current or later life outcomes of young children.

The results contribute to a growing literature on the consequences of income volatility in developing countries. Transitory labour supply on the part of women may have important largely undocumented consequences for the timing of fertility and of human capital investments in children. It is also an important component of macroeconomic adjustment. Women's employment has been argued to increase their autonomy and bargaining power (e.g. Lundberg et al.; 1997; Haddad and Hodinott; 1994) but these benefits are unlikely to flow from transitory employment driven by distress. We found that although the direct effect of fertility (the presence

of a child under the age of five) on mother's employment is negative, the interaction effect is positive. The widespread entry of women into the labour market in response to a decline in demand may have wider adverse effects, contributing to keeping wages low, slowing the process of recovery and, at the aggregate level, creating conditions for a poverty trap.²⁰ This adds to equity considerations an efficiency-based motive for introducing unemployment benefits or other forms of income insurance for families that suffer temporary shocks to income driven by forces that are largely outside their control.

²⁰The key to this is that labour supply decisions are taken at the level of the household. In this case, aggregate demand and unemployment will influence the supply curve of labour, creating potential multiple equilibria (e.g. Basu et al.; 1999). However, if the added workers are, as we find, primarily self-employed, the extent to which this happens will depend upon the linkages between the wage and non-wage sectors.

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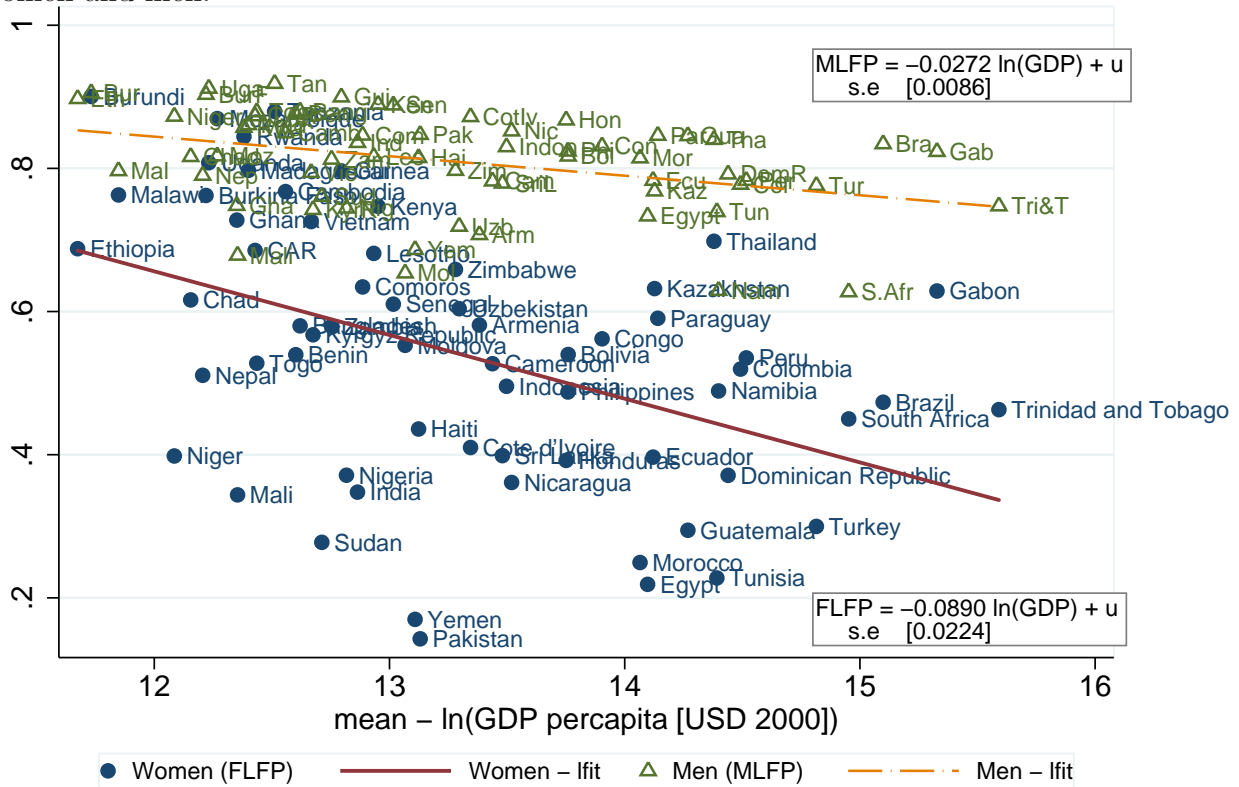
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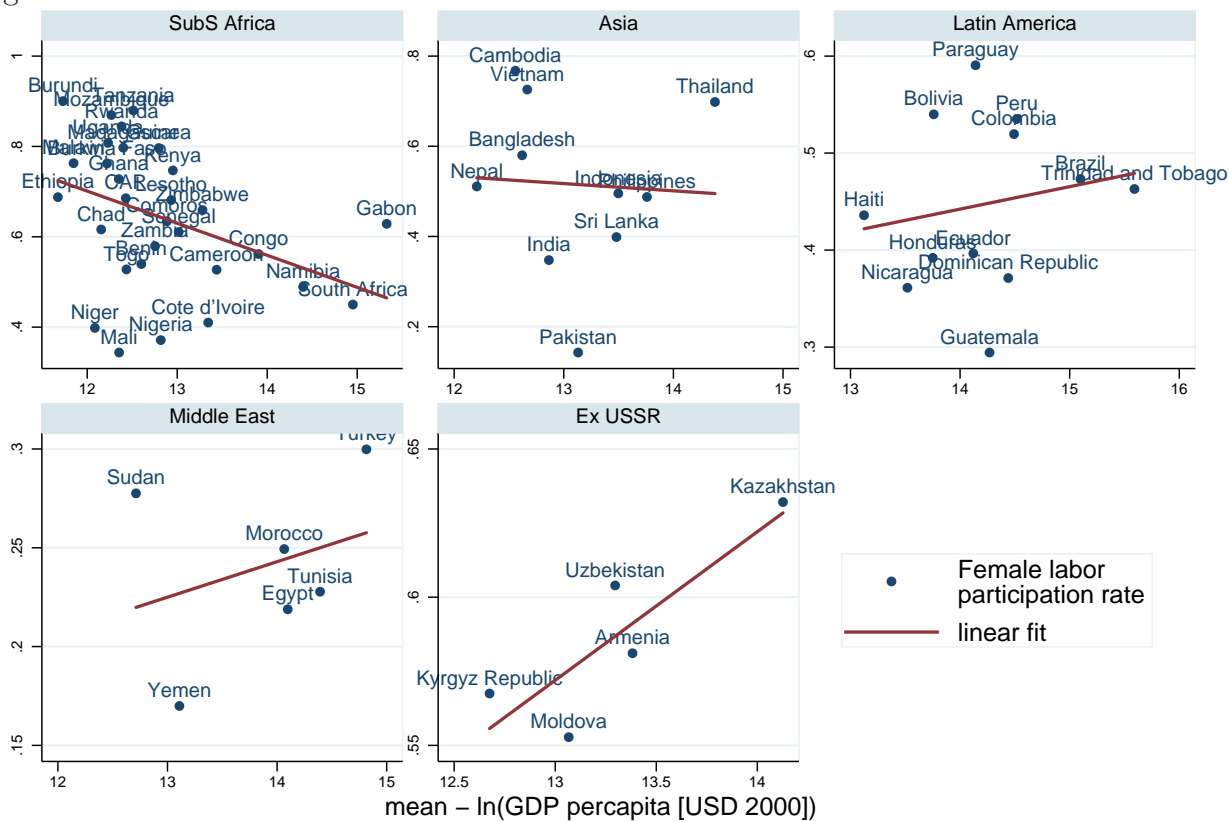
Figures

Figure 1: Labour force participation against income. The between country relationship amongst women and men.



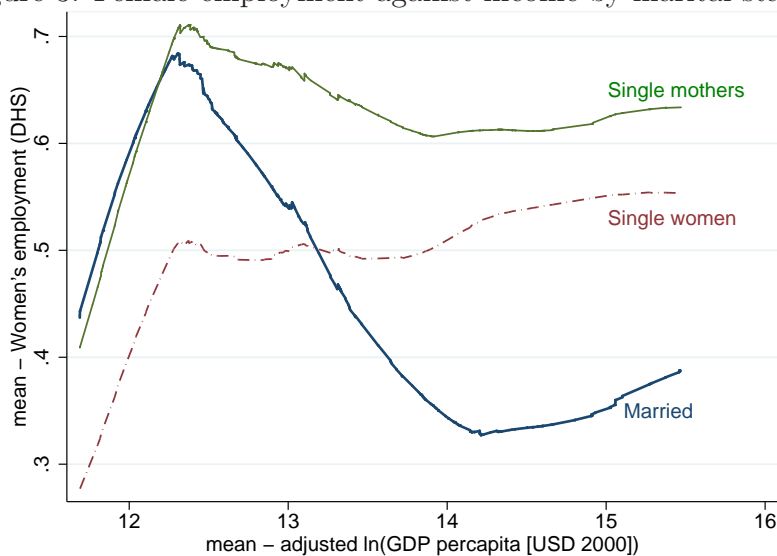
Source: WDI. For every country, we average the income and labour force participation across all years 1986-2006 so that each point is a country.

Figure 2: Female labour force participation against income. Between country relationship by region.



Source: WDI. For every country, we average the income and labour force participation across all years 1986-2006 so that each point is a country.

Figure 3: Female employment against income by marital status.



Source: DHS. Employment and income are averages for each country at irregular intervals (each DHS year).

Tables

Table 1: Countries by region, sub-region, observations, rounds and years of interview.

Country and (Sub-) Region	acronym	total obs.	% obs	Number of surveys	Years of interview
SubSaharan Africa					
West Africa				30	
Benin	BJ	29504	1.7	3	1996, 2001, 2006
Burkina Faso	BF	25276	1.4	3	1992/93, 1998/99, 2003
Cote d'Ivoire	CI	11139	0.6	2	1994, 1998/99
Ghana	GH	19584	1.1	4	1988, 1993, 1998, 2003
Guinea	GN	14707	0.8	2	1999, 2005
Mali	ML	40336	2.3	4	1987, 1995/96, 2001, 2006
Niger	NI	23303	1.3	3	1992, 1998, 2006
Nigeria	NG	26211	1.5	3	1990, 1999, 2003
Senegal	SN	33920	1.9	4	1986, 1992/93, 1997, 2005
Togo	TG	11929	0.7	2	1988, 1998
Central Africa				8	
CAR	CF	5884	0.3	1	1994/95
Cameroon	CM	20028	1.1	3	1991, 1998, 2004
Chad	TD	13539	0.8	2	1996/97, 2004
Congo	CG	7051	0.4	1	2005
Gabon	GA	6183	0.3	1	2000
East Africa				33	
Burundi	BU	3970	0.2	1	1987
Comoros	KM	3050	0.2	1	1996
Ethiopia	ET	29437	1.7	2	2000, 2005
Kenya	KE	30766	1.7	4	1989, 1993, 1998, 2003
Madagascar	MD	21269	1.2	3	1992, 1997, 2003/2004
Malawi	MW	29767	1.7	3	1992, 2000, 2004
Mozambique	MZ	21197	1.2	2	1997, 2003
Rwanda	RW	28293	1.6	3	1992, 2000, 2005
Tanzania	TZ	27687	1.6	3	1992, 1996, 2004
Uganda	UG	27577	1.6	4	1988, 1995, 2000/01, 2006
Zambia	ZM	22739	1.3	3	1992, 1996, 2001/02
Zimbabwe	ZW	25143	1.4	4	1988, 1994, 1999, 2005/2006
South Africa				4	
Lesotho	LS	7095	0.4	1	2004
Namibia	NM	12176	0.7	2	1992, 2000
South Africa	ZA	11735	0.7	1	1998
sub-total	31	590495		75	
Asia					
South Asia				12	
Bangladesh	BD	40751	2.3	4	1993/94, 1996/97, 1999/2000, 2004
India	IA	304465	17.1	3	1992/93, 1998/99, <u>2005/06</u>
Nepal	NP	27948	1.6	3	1996, 2001, <u>2006</u>
Pakistan	PK	6611	0.4	1	1990/91
Sri Lanka	LK	5865	0.3	1	1987

Continued on next page

Table 1: Countries by region, sub-region, observations, rounds and years of interview.

Country and (Sub-) Region	acronym	total obs.	% obs	Number of surveys	Years of interview
Asia Pacific				9	
Indonesia	ID	121254	6.8	5	1987, 1991, 1994, 1997, 2002/2003
Philippines	PH	42645	2.4	3	<u>1993</u> , <u>1998</u> , <u>2003</u>
Thailand	TH	6775	0.4	1	1987
Indochina				4	
Cambodia	KH	32174	1.8	2	<u>2000</u> , <u>2005</u>
Vietnam	VNT	11329	0.6	2	1997, 2002
sub-total	10	599817		25	
Latin America					
Central America and Caribbean				13	
Dominican Republic	DR	46769	2.6	4	1986, 1991, 1996, 2002
Guatemala	GU	17563	1.0	2	1987, 1995
Haiti	HT	26272	1.5	3	1994/95, 2000, 2005
Honduras	HN	19948	1.1	1	2005
Nicaragua	NC	26694	1.5	2	1997/98, 2001
Trinidad and Tobago	TT	3806	0.2	1	1987
South America				19	
Bolivia	BO	45367	2.6	4	1989, 1994, 1998, 2003
Brazil	BR	24727	1.4	3	1986, 1991, 1996
Colombia	CO	78040	4.4	5	1986, 1990, 1995, 2000, 2005
Ecuador	EC	4713	0.3	1	1987
Paraguay	PY	5827	0.3	1	1990
Peru	PE	90140	5.1	5	1986, 1992, 1996, 2000, 2004/2005
sub-total	14	389866		32	
Middle East					
Egypt	EG	68601	3.9	5	1988, 1992, 1995, 2000, 2005
Morocco	MA	32036	1.8	3	1987, <u>1992</u> , <u>2003/2004</u>
Sudan	SD	5860	0.3	1	1990
Tunisia	TN	4184	0.2	1	1988
Turkey	TR	23170	1.3	3	1993, <u>1998</u> , 2003
Yemen	YE	6010	0.3	1	1991/92
sub-total	6	139861		14	
Ex USSR					
Armenia	AM	12996	0.7	2	2000, 2005
Kazakhstan	KK	8571	0.5	2	1995, 1999
Kyrgyz Republic	KY	3848	0.2	1	1997
Moldova	MB	7440	0.4	1	2005
Uzbekistan	UZ	4415	0.2	1	1996
sub-total	5	37270		7	
Total	63 countries	1757309	100	153	

Note: 20 countries had 1 survey, 13 had 2, 17 had 3, 9 had 4 and 4 had 5. Of the 153 surveys, 126 interview a representative sample of all women 15 to 49 years old. These include all countries in Africa, Latin America and ex-USSR. In the other 27 surveys, which pertain to 15 countries in Asia and the Middle East, the sample was restricted to ever-married women. This difference is probably a response to never-married women being scarce in Asia and the Middle East. In Asia, 4 of 10 countries and 7 of 25 surveys have data on all women and, in the Middle East, this is 2 of 6 countries and 3 of 14 surveys. The slanted and underlined years in the table indicate the surveys which collected data for **all** women in Asia and the Middle East. We do not have every country in the Region in our sample.

Table 2: Employment status and individual characteristics of women^{1/}.

	All women	Employment status	
		not working	working
Total	100	50.9	49.1
Cohort			
20-24	18.3	60.9	39.1
25-35	44.3	51.0	49.0
36 +	37.4	45.9	54.1
Education			
None	39.7	49.7	50.3
Some	47.1	52.3	47.7
Complete	13.2	49.3	50.7
Partners' Education			
None	28.3	48.4	51.6
Some	51.0	50.1	49.9
Complete	20.7	56.2	43.8
Wealth quartiles			
1	33.1	50.2	49.8
2	23.9	49.2	50.8
3	22.6	50.8	49.2
4	20.3	54.0	46.1
Area			
Urban	37.5	54.1	45.9
Rural	62.5	48.9	51.1
Marital Status (current)			
Not married ^{2/}	9.8	34.9	65.1
Married	90.3	52.6	47.4
Children under 5 in hh			
No	36.1	48.3	51.7
Yes	63.9	52.3	47.7
log(GDP p.c.) quintile			
1	18.1	34.1	65.9
2	34.7	52.5	47.6
3	9.6	50.7	49.3
4	21.9	62.1	37.9
5	15.7	51.1	48.9
Asymmetry			
booms ($dlgdp^{3/} > 0$)	87.4	51.5	48.5
recessions ($dlgdp^{3/} < 0$)	12.6	46.5	53.5
Continent			
SubS. Africa	31.5	35.6	64.4
Asia	36.8	56.7	43.3
Latin Am.	19.6	49.6	50.4
Middle East	9.8	80.2	19.8
Ex USSR	2.2	51.9	48.1

^{1/} Evermarried women older than 20 years.

^{2/} Evermarried women might not be married at the time of the survey.

Levels of education: *none* - if 0 years of education, *some* - less than complete secondary and *higher* - complete secondary or more.

^{3/} $dlgdp = \ln(gdp)_t - \ln(gdp)_{t-1}$

Table 3: Income effects on women's employment by women's education and region. Country fixed effects.

	N	Total effect ^{1/} (1)	Women's level of education		
			none (2)	some (3)	higher (4)
(A) 43 Countries (T≥2)					
<i>Total</i> ^{2/}					
lgdp	1,000,983	-0.074*	-0.078*	-0.091*	-0.003
s.e.		[0.009]	[0.009]	[0.009]	[0.009]
<i>By region</i>					
SubSAfrica	352,893	0.070*	0.064*	0.075*	0.099*
Asia	428,424	-0.130*	-0.116*	-0.159*	-0.085*
Latin America	219,666	-0.158*	-0.163*	-0.165*	-0.137*
Middle East	104,783	-0.265*	-0.223*	-0.260*	-0.384*
Ex USSR	15,009	-0.217	-0.929	-0.246	-0.178
(B) 13 Countries (T≥4)					
<i>Total</i> ^{2/}					
lgdp	366,868	-0.169*	-0.173*	-0.181*	-0.124*
s.e.		[0.018]	[0.018]	[0.018]	[0.019]
<i>By region</i>					
SubSAfrica	110,422	-0.466*	-0.500*	-0.445*	-0.245*
Asia	95,100	-2.404*	-2.370*	-2.401*	-2.506*
Latin America	161,346	-0.249*	-0.219*	-0.261*	-0.232*
Middle East	65,240	-1.411*	-1.274*	-1.337*	-1.749*
Ex USSR	0				

Robust standard errors (s.e.) in brackets. * significant at 5%

The dependent variable is a dummy for women's employment (mean=0.49). The estimator is OLS. The model includes country fixed effects and trends, the woman's age cohort, her level of education, her current marital status, whether she is household head, her partner's level of education, number of children under five in household, rural/urban location, number of adult members in household, wealth quartile of her household, the share of women of working age in the population, the inverse of the urbanisation rate and seasonal controls; see equation (1) in text. ln(GDP) is interacted with the level of education of the index woman.

^{1/} Total effects are calculated by differentiating equation (3) with respect to income as follows: (i) All women: $\frac{\partial L_{icgt}}{\partial \ln Y_{cgt}} = \beta + \phi_1 * mean(someeduc_{icgt}) + \phi_2 * mean(compleeduc_{icgt})$; (ii) Illiterate women: $\frac{\partial L_{icgt}}{\partial \ln Y_{cgt}} = \beta$; (iii) Less than complete secondary: $\frac{\partial L_{icgt}}{\partial \ln Y_{cgt}} = \beta + \phi_1$; and (iv) Highly educated women: $\frac{\partial L_{icgt}}{\partial \ln Y_{cgt}} = \beta + \phi_2$.

^{2/} Total average income effects include Africa, Asia and Latin America only.

Table 4: Income effects on women's employment by country.

	Sub-Saharan Africa					
	Ghana	Kenya	Mali	Senegal	Uganda	Zimbabwe
log(gdp)	10.609 [1.598]*	-7.871 [0.296]*	0.140 [0.205]	-11.692 [2.344]*	0.573 [0.335]	0.449 [0.086]*
elasticity mean(working)	13.230 0.802	-15.687 0.502	0.236 0.592	-24.425 0.479	0.856 0.669	0.914 0.492
Observations	12,393	19,685	29,843	15,306	18,390	14,805
R-squared	0.13	0.22	0.06	0.06	0.33	0.07

	Asia		Middle East
	Bangladesh	Indonesia	Egypt
log(gdp)	-7.809 [0.466]*	-8.654 [1.036]*	-1.563 [0.211]*
elasticity mean(working)	-29.843 0.262	-17.906 0.483	-8.055 0.194
Observations	34,075	61,025	65,240
R-squared	0.08	0.07	0.17

	Latin America			
	Bolivia	Dominican Rep	Colombia	Peru
log(gdp)	-1.963 [0.200]*	0.615 [0.697]	-1.251 [0.350]*	-0.184 [0.049]*
elasticity mean(working)	-3.457 0.568	1.457 0.422	-2.440 0.513	-0.308 0.597
Observations	28,681	28,620	46,665	57,380
R-squared	0.13	0.12	0.14	0.07

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. These are estimates from country-specific time series, equation (2), for the 13 countries with $T \geq 4$.

Table 5: Income effects by marital status and partners' education.

	N	Marital status			Partner's level of education			
		Total effect	Not married	Currently married	Total effect	none	some	higher
<i>Total</i>	1,000,983							
mean		100	9.7	90.3	100	28.9	50.5	20.6
lgdp		-0.066*	-0.018	-0.071*	-0.079*	-0.091*	-0.094*	-0.029*
s.e.		[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
<i>By region</i>								
		<i>% women in each category</i>			<i>% women in each category</i>			
SubSAfrica	31.8	100	10.7	89.4	100	44.8	47.4	7.9
Asia	38.2	100	6.5	93.5	100	25.6	48.8	25.6
Latin America	19.3	100	15.3	84.7	100	10.1	62.2	27.8
Middle East	9.4	100	7.1	92.9	100	30.8	43.7	25.5
Ex USSR	1.3	100	11.5	88.5	100	0.3	54.5	45.2
		<i>ln(gdp) coefficient</i>			<i>ln(gdp) coefficient</i>			
SubSAfrica	352,893	0.072*	0.061*	0.073*	0.067*	0.055*	0.078*	0.074*
Asia	428,424	-0.130*	-0.069*	-0.134*	-0.130*	-0.118*	-0.155*	-0.094*
Latin America	219,666	-0.154*	-0.131*	-0.158*	-0.158*	-0.164*	-0.163*	-0.145*
Middle East	104,783	-0.257*	-0.258*	-0.257*	-0.260*	-0.190*	-0.253*	-0.358*
Ex USSR	15,009	-0.214	-0.052	-0.236	-0.230	-0.036	-0.249	-0.207

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. The specification estimated corresponds to equation (3). $\ln(\text{GDP})$ is interacted with either the marital status of the index woman or her partner's level of education.

Table 6: Income effects by household wealth quartiles and agricultural land ownership.

	N	Household wealth quartiles					N	Owns agricultural land		
		Total effect	first	second	third	fourth		Total effect	No	Yes
<i>Total</i>	1,000,983						918,020			
mean		100	33.1	24.2	22.6	20.2		100	70.3	29.7
lgdp		-0.068*	-0.093*	-0.083*	-0.053*	-0.028*		-0.043*	-0.034*	-0.069*
s.e.		[0.009]	[0.009]	[0.009]	[0.009]	[0.009]		[0.010]	[0.010]	[0.010]
<i>By region</i>										
			<i>mean of hh wealth (index)</i>					<i>% women in each category</i>		
SubSAfrica	31.8	100	38.4	21.3	21.0	19.4	33.7	100	56.4	43.6
Asia	38.2	100	30.3	22.3	24.0	23.4	34.9	100	73.5	26.5
Latin America	19.3	100	31.4	30.5	21.5	16.6	20.7	100	87.6	12.5
Middle East	9.4	100	30.9	27.7	23.9	17.5	9.2	100	90.6	9.4
Ex USSR	1.3	100	30.0	30.2	23.0	16.8	1.5	100	94.1	5.9
			<i>ln(gdp) coefficient</i>					<i>ln(gdp) coefficient</i>		
SubSAfrica	352,893	0.075*	0.063*	0.065*	0.072*	0.110*	344,442	0.066*	0.094*	0.027
Asia	428,424	-0.133*	-0.157*	-0.184*	-0.124*	-0.065*	357,618	-0.144*	-0.190*	-0.017
Latin America	219,666	-0.155*	-0.138*	-0.176*	-0.160*	-0.145*	215,960	-0.160*	-0.169*	-0.097*
Middle East	104,783	-0.246*	-0.093	-0.278*	-0.329*	-0.353*	95,072	-0.574*	-0.643*	0.094
Ex USSR	15,009	0.378	0.186	0.435	0.483	0.475	14,979	-0.146	-0.137	-0.283

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. The specification estimated corresponds to equation (3). ln(GDP) is interacted with either the wealth quartile of household or the family's land ownership.

Table 7: Income effects by location and fertility.

	N	Zone			Children under 5 in household		
		Total effect	urban	rural	Total effect	No	Yes
<i>Total</i>	1,000,983						
mean		100	37.3	62.7	100	36.1	63.9
lgdp		-0.061*	-0.029*	-0.081*	-0.073*	-0.047*	-0.087*
s.e.		[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
<i>By region</i>							
		<i>% women in each category</i>			<i>% women in each category</i>		
SubSAfrica	31.8	100	25.1	74.9	100	22.0	78.0
Asia	38.2	100	29.0	71.0	100	44.0	56.0
Latin America	19.3	100	65.7	34.3	100	39.4	60.6
Middle East	9.4	100	50.9	49.1	100	41.1	59.0
Ex USSR	1.3	100	58.9	41.1	100	62.7	37.3
		<i>ln(gdp) coefficient</i>			<i>ln(gdp) coefficient</i>		
SubSAfrica	352,893	0.072*	0.098*	0.063*	0.070*	0.088*	0.065*
Asia	428,424	-0.134*	-0.097*	-0.149*	-0.125*	-0.079*	-0.162*
Latin America	219,666	-0.155*	-0.161*	-0.144*	-0.159*	-0.148*	-0.165*
Middle East	104,783	-0.276*	-0.425*	-0.122	-0.277*	-0.267*	-0.283*
Ex USSR	15,009	0.460	0.602	0.257	-0.195	-0.156	-0.261

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. The specification estimated corresponds to equation (3). $\ln(\text{GDP})$ is interacted with either rural/urban location or whether there are children under five in household.

Table 8: Income effects by cohort, education and fertility

Cohort	N	Women's level of education				Children under 5 in household		
		Total effect	none	some	higher	Total effect	No	Yes
		<i>% women in each category</i>				<i>% women in each category</i>		
20-24	18.4	100	36.3	52.4	11.3	100	18.5	81.5
25-35	44.2	100	38.8	46.6	14.6	100	26.3	73.7
36+	37.4	100	45.1	43.1	11.9	100	56.3	43.7
		<i>ln(gdp) coefficient</i>				<i>ln(gdp) coefficient</i>		
<i>20-24</i>	185,114							
lgdp		-0.060*	-0.060*	-0.077*	0.023	-0.051*	-0.011	-0.060*
s.e.		[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]
<i>25-35</i>	446,858							
lgdp		-0.081*	-0.081*	-0.101*	-0.013	-0.077*	-0.053*	-0.085*
s.e.		[0.014]	[0.014]	[0.014]	[0.014]	[0.014]	[0.014]	[0.014]
<i>36+</i>	369,011							
lgdp		-0.111*	-0.119*	-0.119*	-0.053*	-0.113*	-0.100*	-0.128*
s.e.		[0.015]	[0.015]	[0.015]	[0.016]	[0.015]	[0.015]	[0.015]

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. The specification estimated corresponds to Equation (3). $\ln(\text{GDP})$ is interacted with either the level of education of the index woman (as in Table 3), or whether there are children under five in household (as in Table 7).

Table 9: Evermarried women. Employment transitions

	N	Total effect	Women's level of education		
			none	some	higher
Total					
<i>Self- employed</i>					
lgdp	855,377	-0.635*	-0.685*	-0.590*	-0.639*
odds ratio		0.530*	0.504*	0.554*	0.528*
s.e.		[0.087]	[0.088]	[0.088]	[0.088]
<i>Not working</i>					
lgdp		2.183*	2.165*	2.277*	1.899*
odds ratio		8.875*	8.717*	9.744*	6.680*
s.e.		[0.071]	[0.071]	[0.071]	[0.072]
<i>By region</i>			<i>ln(gdp) coefficient</i>		
SubSAfrica					
Self- employed	306,175	-3.056*	-3.202*	-2.891*	-2.779*
odds ratio		0.047*	0.041*	0.056*	0.062*
Not working		-2.504*	-2.581*	-2.424*	-2.272*
odds ratio		0.082*	0.076*	0.089*	0.103*
Asia					
Self- employed	362,594	-1.509*	-1.791*	-1.283*	-1.295*
odds ratio		0.221*	0.167*	0.277*	0.274*
Not working		-3.913*	-4.129*	-3.674*	-3.951*
odds ratio		0.020*	0.016*	0.025*	0.019*
Latin America					
Self- employed	186,608	0.532	0.287	0.499	0.772*
odds ratio		1.702	1.332	1.647	2.164*
Not working		10.393*	10.219*	10.400*	10.480*
odds ratio		32640*	27407*	32856*	35599*
Middle East					
Self- employed	95,792	11.266*	10.558*	11.618*	12.342*
odds ratio		78097*	38488*	111047*	229131*
Not working		-5.008*	-5.402*	-5.022*	-3.955*
odds ratio		0.007*	0.005*	0.007*	0.019*
Ex USSR					
Self- employed	14,247	39.926*	31.183*	38.967*	41.208*
odds ratio		2.186e+17*	3.487e+13*	8.376e+16*	7.878e+17*
Not working		5.847	9.792	5.421	6.390
odds ratio		346.304	17892	226.203	596.051

Robust standard errors in brackets. * significant at 5%. See notes to Table 3. These are multinomial logit estimates run on a sample and specification similar to that for equation (1).

Table 10: Robustness checks.

	Individual Controls (1)	Country fixed effects and trends (2)	Unadjusted gdp (3)	lagged gdp (4)	quadratic gdp (5)	Macro shocks (6)
log(gdp)	-0.179* [0.001]	-0.067* [0.009]		-0.255* [0.035]	1.405* [0.178]	-0.028 [0.015]
Unadjusted log(gdp)			-0.043* [0.009]			
$\log(gdp)_{t-1}$				0.212* [0.038]		
$[\log(gdp)]^2$					-0.056* [0.007]	
Rain shocks						-0.001 [0.002]
Net barter terms of trade ^{1/}						0.045* [0.007]
Inflation ^{2/}						0.109* [0.017]
conflict deaths<1000 ^{3/}						0.029* [0.006]
conflict deaths>1000 ^{4/}						0.013 [0.007]
M2 as % of GDP						-0.023* [0.002]

Robust standard errors in brackets. * significant at 5%

Results include Africa, Asia and Latin America only. Column 2 shows the baseline model (Equation (1) in text). It corresponds to the equation in Table 3 with the difference that the equation is estimated including interactions of ln(GDP) with education, i.e. Equation (3).

Columns 3,4,5 are run using the specification in column 2

^{1/} Net barter terms of trade (2000 = 100): The net barter terms of trade is the ratio (expressed as a percentage) of relative export and import prices when volume is held constant

^{2/} Inflation, consumer prices (annual %)/1000

^{3/} Civil conflict with 25 to 999 battle deaths per year (minor conflict)

^{4/} Civil conflict with 1000 battle deaths or more per year (war)

Table 11: Income effects on women's employment by women's education and region. Sub-Region fixed effects.

	N	Total effect (1)	Women's level of education		
			none (2)	some (3)	higher (4)
(A) 43 Countries (T\geq2)					
<i>Total</i>					
lgdp	1,000,983	0.019*	0.033*	-0.012*	0.082*
s.e.		[0.002]	[0.003]	[0.002]	[0.003]
<i>By continent</i>					
SubSAfrica	352,893	0.152*	0.186*	0.109*	0.146*
Asia	428,424	-0.225*	-0.215*	-0.248*	-0.182*
Latin America	219,666	-0.008	-0.025*	-0.015	0.024*
Middle East	104,783	0.235*	0.266*	0.244*	0.132*
Ex USSR	15,009	-0.217	-0.929	-0.246	-0.178
(B) All 63 countries (T\geq1)					
<i>Total</i>					
lgdp	1,065,404	0.014*	0.023*	-0.014*	0.086*
s.e.		[0.002]	[0.002]	[0.002]	[0.003]
<i>By continent</i>					
SubSAfrica	378,145	0.068*	0.111*	0.016*	0.078*
Asia	446,423	-0.219*	-0.227*	-0.230*	-0.162*
Latin America	240,836	-0.031*	-0.050*	-0.034*	-0.011
Middle East	118,846	0.045	0.062*	0.042	0.004
Ex USSR	26,423	-0.122	0.008	-0.133	-0.110

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. The specification estimated corresponds to equation (4) in text.

Table 12: Asymmetric effects.

	N	Total effect	boom	recession
<i>Total</i>				
mean		100	88.2	11.8
lgdp	1,000,983	-0.075*	-0.073*	-0.092*
s.e.		[0.009]	[0.009]	[0.010]
<i>By region</i>				
		<i>% women in each category</i>		
SubSAfrica	31.8	100	79.3	20.7
Asia	38.2	100	95.3	4.7
Latin America	19.3	100	84.4	15.6
Middle East	9.4	100	98.3	1.7
Ex USSR	1.3	100	81.8	18.2
		<i>ln(gdp) coefficient</i>		
SubSAfrica	352,893	-0.026	-0.022	-0.041
Asia	428,424	-0.128*	-0.124*	-0.211*
Latin America	219,666	-0.078*	-0.074*	-0.096*
Middle East	104,783	0.090	-0.320*	21.752*
Ex USSR	15,009	-0.441	0.693	-5.454

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. $\ln(\text{GDP})$ is interacted with an indicator for recession ($recession = 1$ if $d\ln(gdp) = \ln(gdp)_t - \ln(gdp)_{t-1} < 0$ - see Section 4.4.3).

Appendix

Table A1: Employment rates by individual characteristics of women and men.

	Women						Men					
	All	SubS. Africa	Asia	Latin Am.	Middle East	Ex USSR	All	SubS. Africa	Asia	Latin Am.	Middle East	Ex USSR
Total	49.1	64.4	43.3	50.4	19.8	48.1	98.3	98.6	98.2	99.1	98.0	89.8
Cohort												
20-24	39.1	56.0	31.7	35.5	10.6	25.0						
25-35	49.0	64.4	43.1	49.7	19.6	44.3						
36 +	54.1	69.4	49.3	57.0	23.5	57.6						
Education												
None	50.3	63.6	48.3	44.3	13.6	40.0	98.7	99.1	98.3	99.3	97.4	69.8
Some	47.7	64.7	41.0	46.7	16.6	41.9	98.4	98.4	98.4	99.3	98.3	89.8
Complete	50.7	71.7	34.3	64.6	45.8	56.0	97.5	97.4	97.7	98.6	98.4	89.8
Partners' education												
None	51.6	63.0	50.5	40.0	14.3	45.2						
Some	49.9	65.2	46.3	47.9	17.5	43.7						
Complete	43.8	66.5	30.0	60.3	31.7	53.1						
Wealth quartiles												
1	49.8	63.1	48.0	43.2	19.0	43.1	98.5	98.5	98.5	99.5	98.2	88.5
2	50.8	66.3	48.6	51.9	17.6	43.0	98.4	98.8	98.3	99.3	98.0	87.3
3	49.2	65.0	42.9	53.7	19.1	51.6	98.1	98.6	98.1	98.6	97.7	90.8
4	46.1	64.1	32.5	57.2	25.5	58.8	98.2	98.6	97.9	98.7	98.3	93.3
Area												
Urban	45.9	62.3	33.5	54.5	21.0	49.8	97.9	98.0	97.8	98.9	98.0	89.5
Rural	51.1	65.1	47.2	43.1	18.6	46.3	98.6	98.9	98.4	99.5	98.1	90.0
Marital Status												
Not married	65.1	70.3	64.4	68.1	29.6	63.6						
Married	47.4	63.7	41.8	47.3	19.1	46.2						
Children under 5 in hh												
No	51.7	67.0	48.1	57.9	24.7	55.7	97.8	98.3	97.7	99.1	97.3	89.3
Yes	47.7	63.6	39.5	45.7	16.7	37.2	98.6	98.7	98.5	99.2	98.5	90.4

Continued on next page

Table A1: Employment rates by individual characteristics of women and men. Continued

	Women						Men					
	All	SubS. Africa	Asia	Latin Am.	Middle East	Ex USSR	All	SubS. Africa	Asia	Latin Am.	Middle East	Ex USSR
log(GDP p.c.) quintile												
1	65.9	64.3	79.6	0.0	0.0	0.0	99.2	99.2	99.3			
2	47.5	75.4	40.0	0	8.3	50.0	98.2	99.4	97.8		100.0	93.3
3	49.3	54.0	16.9	55.6	13.0	45.9	95.8	97.5	97.3	97.9	94.1	87.0
4	37.9	70.7	46.3	46.0	18.6	53.2	98.3	92.5	98.7	98.6	97.9	96.0
5	48.9	44.8	60.5	52.3	28.0	0.0	99.0	92.8	99.7	99.5	99.5	
Asymmetry												
booms ($dlgdp^{1/} > 0$)	48.5	65.4	43.3	50.4	20.5	45.8	98.4	98.9	98.1	99.2	98.2	87.4
recessions ($dlgdp^{1/} < 0$)	53.5	60.8	42.1	50.9	9.5	56.0	98.0	97.7	99.9	98.5	96.2	97.9
Financial Development												
M2 as % GPD												
1	63.6	67.4	70.6		8.3	43.8	97.6	98.6	98.3		100.0	88.6
2	57.8	61.4		57.4	31.1	64.0	98.8	98.8		99.5	99.6	89.4
3	47.0	63.9	24.8	45.3	14.0		98.9	98.7	98.4	99.3	94.1	
4	40.4	58.5	43.3	53.6	18.1		98.0	97.4	98.1	97.7	97.9	
Private credit												
1	61.4	65.7	70.6		11.0	38.9	97.9	99.1	98.3		97.2	84.7
2	63.5	71.0		59.6	31.1	58.1	98.5	98.5		99.2	99.6	93.0
3	38.6	51.0	37.2	34.9			98.2	98.8	97.9	99.0		
4	42.8	47.6	54.9	50.3	18.1		98.6	98.6	98.7	99.1	97.9	

Notes: Evermarried women older than 20 years old

Levels of education:

none - if 0 years of education

some - less than complete secondary

higher - complete secondary or more

^{1/} $dlgdp = \ln(gdp)_t - \ln(gdp)_{t-1}$

Table A2: Distribution of women in each region by individual characteristics.

	All women	SubS. Africa	Asia	Latin Am.	Middle East	Ex USSR
Total	100	100	100	100	100	100
Cohort						
20-24	18.3	20.5	18.7	15.9	15.1	13.7
25-35	44.3	46.0	44.2	42.7	44.3	37.9
36 +	37.4	33.6	37.1	41.4	40.7	48.4
Education						
None	39.7	52.2	43.7	12.6	47.8	0.2
Some	47.1	44.2	42.6	64.8	36.3	56.0
Complete	13.2	3.6	13.7	22.7	15.9	43.8
Partners' Education						
None	28.4	43.7	25.4	10.0	33.7	0.2
Some	50.9	47.8	49.2	63.2	42.4	53.5
Complete	20.7	8.5	25.4	26.9	23.9	46.3
Wealth quartiles						
1	33.1	38.2	30.5	31.3	31.3	29.7
2	23.9	21.4	22.1	29.7	27.0	27.1
3	22.6	20.9	24.1	21.9	23.5	24.3
4	20.3	19.5	23.4	17.1	18.2	18.8
Area						
Urban	37.5	26.4	28.7	64.5	49.2	50.5
Rural	62.5	73.6	71.3	35.5	50.8	49.6
Marital Status						
Not married	9.75	11.0	6.5	15.1	7.0	10.8
Married	90.25	89.0	93.5	84.9	93.0	89.2
Children under 5 in hh						
No	36.1	22.7	43.8	39.0	39.1	58.9
Yes	63.9	77.3	56.2	61.0	60.9	41.1
Working						
No	50.9	35.6	56.7	49.6	80.2	51.9
Yes	49.1	64.4	43.3	50.4	19.8	48.1
Occupation						
not working	42.0	29.1	50.2	35.0	77.1	45.0
agriculture	25.9	39.2	28.4	9.6	7.5	11.0
non agriculture	32.2	31.8	21.4	55.5	15.4	44.0
Type of work						
not working	56.2	38.3	64.0	54.2	87.7	52.3
self employed	25.0	50.1	10.8	24.8	2.8	5.5
paid employee	18.9	11.6	25.3	21.0	9.5	42.2

Notes: Evermarried women older than 20 years old

Levels of education:

none - if 0 years of education

some - less than complete secondary

higher - complete secondary or more

Table A3: Summary statistics.

Variable	Description	Obs	Mean	Std. Dev.	Min	Max	Source
working	respondent currently working (v714)	1,266,463	0.489	0.500	0	1	DHS
lgdp	log(real GDP percapita - constant US\$ 2000)	1,265,016	13.273	0.833	11.687	15.471	WDI
cohort1	woman is 20-24 years old	1,266,463	0.180	0.384	0	1	DHS
cohort2	woman is 25-35 years old	1,266,463	0.444	0.497	0	1	DHS
cohort3	woman is 36 years old or older	1,266,463	0.376	0.484	0	1	DHS
noeduc	woman - no education	1,265,566	0.385	0.486	0	1	DHS
someeduc	woman - some educ	1,265,566	0.480	0.500	0	1	DHS
compleduc	woman - higher educ	1,265,566	0.135	0.342	0	1	DHS
noeduc_h	partner - no education	1,219,287	0.273	0.445	0	1	DHS
someeduc_h	partner - some educ	1,219,287	0.513	0.500	0	1	DHS
compleduc_h	partner - higher educ	1,219,287	0.214	0.410	0	1	DHS
chunder5	number of children 5 and under	1,266,463	1.170	1.251	0	21	DHS
married	woman is married or living together	1,265,721	0.896	0.305	0	1	DHS
rural	woman lives in rural area	1,266,463	0.594	0.491	0	1	DHS
hhhead	woman is household (hh) head	1,266,463	0.106	0.308	0	1	DHS
hhsiz	number of adult members in hh	1,266,463	5.299	3.136	1	66	DHS
wealthqa1	hh wealth - quartile 1	1,260,478	0.329	0.470	0	1	DHS. Authors' calculations
wealthqa2	hh wealth - quartile 2	1,260,478	0.232	0.422	0	1	DHS. Authors' calculations
wealthqa3	hh wealth - quartile 3	1,260,478	0.220	0.414	0	1	DHS. Authors' calculations
wealthqa4	hh wealth - quartile 4	1,260,478	0.219	0.413	0	1	DHS. Authors' calculations
pwomworkage	% women of working age	1,266,463	0.000	0.000	0.000	0.003	DHS. Authors' calculations
ruralpop_per	rural (% of total) population	1,266,463	0.622	0.178	0.192	0.944	WDI
q1	Interview was in first quarter	1,266,463	0.260	0.439	0	1	
q2	Interview was in second quarter	1,266,463	0.288	0.453	0	1	
q3	Interview was in third quarter	1,266,463	0.196	0.397	0	1	
q4	Interview was in last quarter	1,266,463	0.255	0.436	0	1	
rain_dev	Rain shocks	1,059,296	-0.243	0.802	-9.082	1.157	FAO
termstrade	Net barter terms of trade (2000 = 100)	1,129,505	1.053	0.202	0.596	2.059	WDI
inflation	Inflation, consumer prices (annual %)/1000	1,232,587	0.018	0.059	-0.005	1.097	WDI
minor	conflict deaths _t /1000	1,266,463	0.277	0.448	0	1	International Peace Research Institute
war	conflict deaths _t /1000	1,266,463	0.185	0.388	0	1	International Peace Research Institute

Table A4: Covariates.

	Country fixed effects and trends
log(gdp)	-0.067* [0.009]
woman is 25-35 y-o	0.089* [0.001]
woman is 36y-o or older	0.116* [0.002]
woman - some educ	-0.035* [0.001]
woman - higher educ	0.059* [0.002]
partner - some educ	-0.008* [0.001]
partner - higher educ	-0.062* [0.002]
No. children under 5	-0.017* [0.000]
married or living together	-0.119* [0.002]
rural	0.050* [0.001]
woman is hh head	0.068* [0.002]
No. adult members in hh	-0.001* [0.000]
hh wealth - quartile 2	0.029* [0.001]
hh wealth - quartile 3	0.019* [0.001]
hh wealth - quartile 4	-0.013* [0.002]
% women working age	-115.628* [8.241]
rural (% of total) pop	-2.252* [0.196]
Interview was in second quarter	0.013 [0.001]*
Interview was in third quarter	0.017 [0.002]*
Interview was in fourth quarter	0.020 [0.002]*
Constant	2.881* [0.258]
Observations	1,000,983
R-squared	0.16

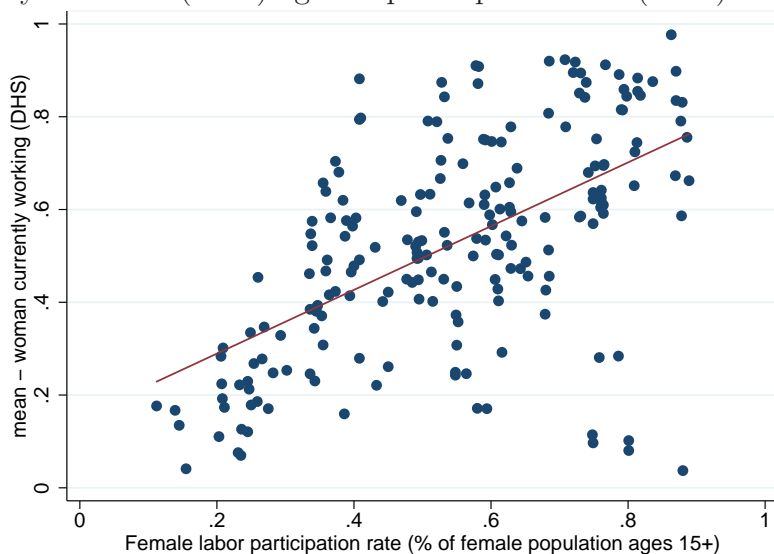
Robust standard errors in brackets. * significant at 5%. Results are from the baseline model (Equation (1) in text) and include Africa, Asia and Latin America only. See notes to Table 3.

Table A5: Income effects on women's employment by women's education and region. Region fixed effects.

	N	Total effect (1)	Women's level of education		
			none (2)	some (3)	higher (4)
(A) 43 Countries (T\geq2)					
<i>Total</i>					
lgdp	1,000,983	-0.046*	-0.043*	-0.072*	0.036*
s.e.		[0.002]	[0.002]	[0.002]	[0.003]
<i>By continent</i>					
SubSAfrica	352,893	-0.023*	0.035*	-0.093*	-0.080*
Asia	428,424	-0.171*	-0.168*	-0.192*	-0.120*
Latin America	219,666	-0.149*	-0.160*	-0.157*	-0.122*
Middle East	104,783	0.235*	0.266*	0.244*	0.132*
Ex USSR	15,009	-0.217	-0.929	-0.246	-0.178
(B) All 63 countries (T\geq1)					
<i>Total</i>					
lgdp	1,065,404	-0.064*	-0.063*	-0.089*	0.024*
s.e.		[0.002]	[0.002]	[0.002]	[0.002]
<i>By continent</i>					
SubSAfrica	378,145	-0.069*	-0.015*	-0.132*	-0.095*
Asia	446,423	-0.088*	-0.105*	-0.092*	-0.022*
Latin America	240,836	-0.033*	-0.057*	-0.033*	-0.020*
Middle East	118,846	0.045	0.062*	0.042	0.004
Ex USSR	26,423	-0.122	0.008	-0.133	-0.110

Robust standard errors (s.e.) in brackets. * significant at 5%. See notes to Table 3. The specification estimated corresponds to equation (5) in text.

Figure A1: Employment rate (DHS) against participation rate (WDI) scatter and linear fit



Source-DHS and WDI. Each point is a country for each year in which DHS was collected

A Data Appendix

This section presents further information on the sources and definitions of the variables used in the analysis. The Demographic and Health Surveys (DHS) are available at www.measuredhs.com, where information on survey design and sampling strategy is available.

The Julian and Nepali calendar. The Julian calendar is 7 years and 8 months behind the Gregorian calendar. The cutoff date for asking health questions is normally in Meskerem which roughly corresponds to September (see Chapter 8 of the 2000 and 2005 DHS reports for Ethiopia). The Nepali calendar is 56 years and 9 months ahead the Gregorian calendar. The cutoff date for asking health questions is normally in Baisakh which corresponds to April (see Chapter 8 of the 2001 and 2006 DHS reports for Nepal).

Employment (the dependent variable): Source: DHS. Women are asked the following question: “As you know, some women take up jobs for which they are paid in cash or kind. Others sell things, have a small business or work on the family farm or in the family business. Are you currently [in the last 7 days] doing any of these things or any other work? (y/n)”. Our employment variable is the response to this question. Women who work were classified into two categories, paid employee and self-employed using three DHS variables. Every women was asked (i) whether she worked for a family member, for someone else or was self-employed (v719) and (ii) whether she received cash for this work (v720)²¹ or (iii) whether she received

²¹Available from 1990-1999

cash for her work, or was paid in kind, or in cash and kind, or not paid (v741)²². As a check on the DHS data, we obtained employment rates as country-level means and compared these with the labour force participation rates for the 15+ population recorded in the World Development Indicators of the World Bank (<http://publications.worldbank.org/WDI/>) (see Figure A1). The labor force participation rate is defined as the proportion of the population (ages 15+) that is economically active, i.e. who supply labor for the production of goods and services.

GDP Per capita GDP in constant 2000 USD from the World Development Indicators (WDI) of the World Bank (<http://publications.worldbank.org/WDI/>). We adjust GDP for month of interview. For example, if a woman is interviewed in December 1992, then she is matched to GDP for the calendar year Jan-Dec 1992. If she is interviewed January 1993 then she is matched to GDP constructed as $1/12(\text{GDP in 1993}) + 11/12(\text{GDP in 1992})$, and so on.

Education: Source: DHS. We identified cut-off points for the number of years of education needed to complete primary and secondary school by (sub-)regions, and created the variables accordingly. People complete secondary school when they have 12 years of education in Sub-Saharan Africa, Middle East, Asia Pacific and Central America and the Caribbean; 11 years in South America and 10 years in South Asia. For women who do not have a partner at the time of the survey (i.e who are not “currently married”) the indicators for partner’s education are set to zero and an indicator for current marital status is included in the model.

Wealth index. Source: DHS. The index is calculated as the first principal component using DHS information on the household’s ownership of radio, fridge, bike, motorbike, car and television set, the type of toilet (flush, pit, none) and whether the household has electricity. Agricultural land was not included in the index as only women who reported working in agriculture were asked about land ownership.

Rural population as % of total population. Source: WDI of the World Bank

Rainfall Rainfall data are obtained from the Food and Agriculture Organization of the United Nations (FAO) (http://geonetwork3.fao.org/climpag/agroclimdb_en.php). We constructed rainfall shocks as deviations from the mean of country rainfall across 1985-2005 excluding the year of interview.

Net barter terms of trade (2000 = 100). Source: WDI of the World Bank. Net barter terms of trade are the ratio of the export price index to the corresponding import price index measured relative to the base year 2000.

Inflation, consumer prices (annual %). Source: WDI of the World Bank. Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.

²²Available from 2000-2006. Payment in kind or in kind and cash is considered paid work.

Civil War Data on civil conflict and war were obtained from the International Peace Research Institute (<http://www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/>). Civil conflict is defined as 25 to 999 battle deaths per year and war as at least 1000 battle deaths per year. Conflicts might be internal (within the same country) or external (between countries). An external conflict counted as one for each of the countries involved in the conflict. We identified more than one conflict for some years in Ethiopia, India, Niger, Nigeria, Pakistan, Philippines, South Africa, Sri Lanka and Turkey, the most critical conflict (a war, or cumulated war) was selected as the main conflict in each country.

A.1 Distribution of women by individual characteristics

Table A2 shows the distribution of women by individual characteristics. About 18% of women are of age 20-24, 44% are 25-35 and 38% are 35-49 years. On average almost 40% of women are uneducated, 13% have secondary or higher education and the rest are at some intermediate level. Amongst their partners, 28% are uneducated and 21% have secondary or higher education. The age distribution is similar across regions but the education distribution is not. African women are much less educated than Latin American women and Asia lies between. As many as 52% of African women are uneducated and only 3.6% have at least secondary education. In Latin America, the corresponding figures are 12.6% and 22.7%. Across our sample, 62.5% of women live in rural locations, Africa is the least urbanised of the three regions and Latin America the most. 90% of all ever-married women are married and 64% have at least one child under the age of five at the time of the survey. African and Latin American women are much less likely to be (currently) married than Asian women. Self employment is concentrated in agriculture and sales, the share of agriculture being largest in Africa and smallest in Latin America²³.

B Media coverage: women's participation in recessions

Overview: The UK Guardian newspaper and Channel 4 news suggest that in this, as in the 1980s recession, part-time work amongst women is on the rise even as male unemployment is rising while the UK Trade Union Congress suggests that women may do worse in this recession than before and this is echoed in a report for the US. Based upon a survey of the UK corporate world, The Times newspaper argues that women are exiting employment twice as fast as men but that this is voluntary. A piece by the international news editor of The Star similarly captures

²³There is a distinction between self- and informal employment. "Informal" is probably best described as unregulated. So while informal work will typically encompass self employment it also tends to include paid employment. Development economists and practitioners are increasingly interested in each category, informal sector employment and self employment; witness the keynote address on this and the several sessions dedicated to it at the 2009 Employment and Development Conference organised by the World Bank and IZA (http://www.iza.org/conference_files/worldb2009/izawb2009program.pdf)

conflicting views of the impact of the current recession on women in poorer countries. Perusal of these seemingly alternative viewpoints suggests that distinguishing part-time from full-time work and the status of married from unmarried women brings them much closer than they may appear. The press articles referred to are below.

“Though the last unemployment statistics show the number of women in full-time work to have fallen by 53,000 in the last quarter compared with a drop of 36,000 for men, officials at the Department for Work and Pensions [UK] point to an increase in part-time employment among women, a higher male redundancy rate, and a higher male unemployment rate (The Guardian 2009).” “The recession of the early 80s had a devastating effect on predominantly male working-class employment, but it wasn’t too bad for their daughters, who began to enter the workforce like never before, especially in areas like financial services and retail (Channel 4 News 2008)”. “So far it looks as though women’s jobs will be affected more than in previous recessions Since the start of the 2008 the female redundancy rate has increased by 2.3 percentage points, almost double the rate of male increase. If there were a major drive to cut public spending even more women would find their jobs were at risk, as there are more women than men employed in the public sector A quarter of households are single parent in the UK and 90% of these are headed by women (Trade Union Congress 2009).”

“In January, reports that women were losing their jobs twice as fast as men led to speculation that they were being illegally targeted by employers attempting to avoid the costs of maternity leave or flexible working. Yet women are choosing to leave lucrative careers by taking voluntary redundancy, the research shows (The Times 2009)”.

In contrast to previous recessions, in which women have typically fared somewhat better than men, early signs indicate that this recession is hitting women harder than men The effects of this reduction will be compounded by the fact that women and female-headed households are generally less able to absorb the effects of a recession than their male counterparts (US Senate 2008).

Although the global downturn began in the financial sector, dominated by men, it is now bearing down on women [in developing countries], most often found in low-wage and part-time jobs. Along with increased risk there is great opportunity for women in the current crisis (The Star 2009).